APRIL

THE MGA BULLETIN

1950

No. 19

ORGAN OF THE MUSHROOM GROWERS' ASSOCIATION

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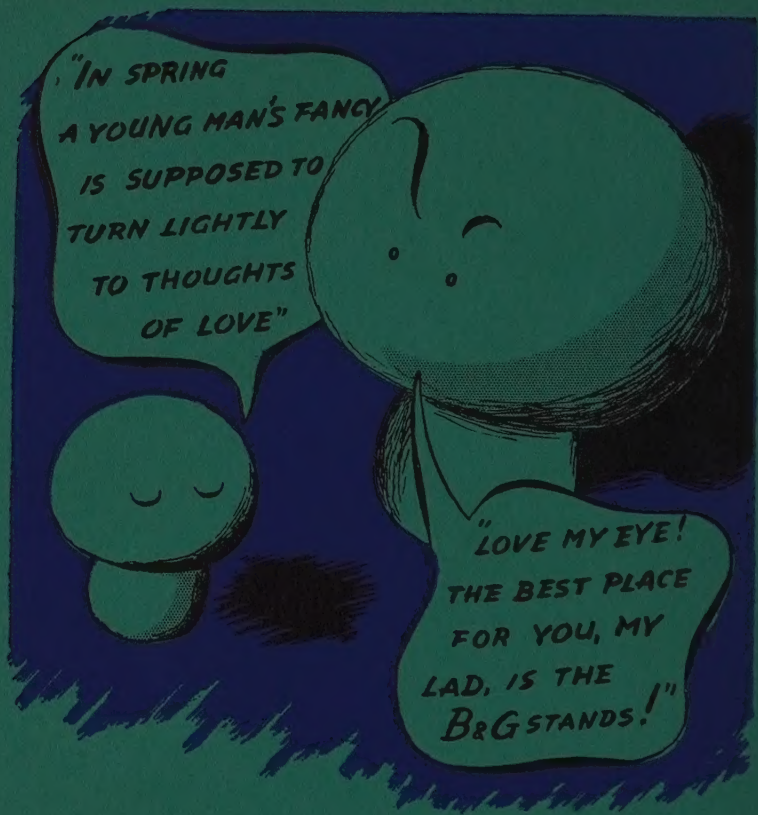
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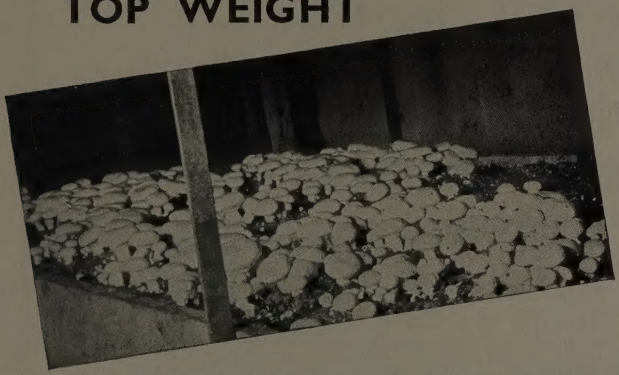

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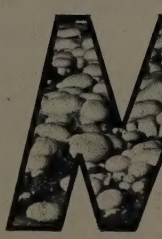

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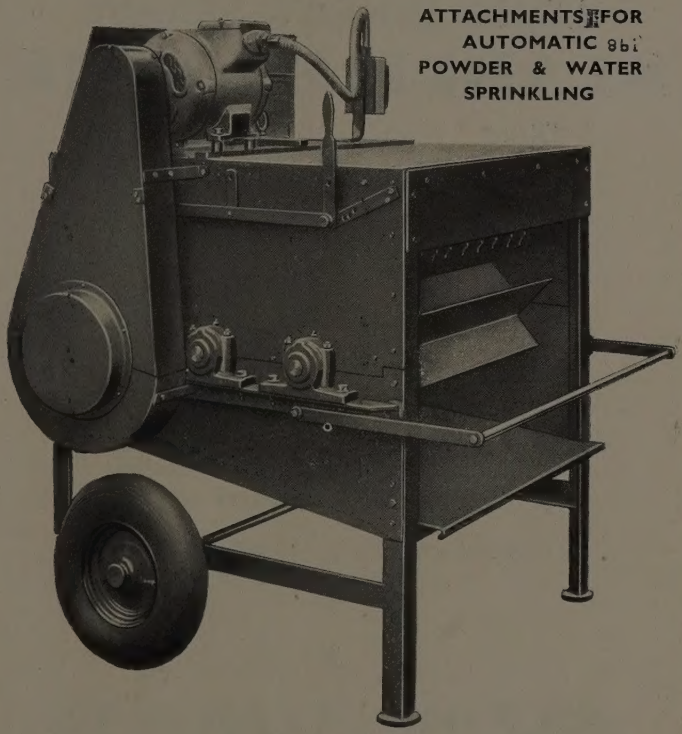

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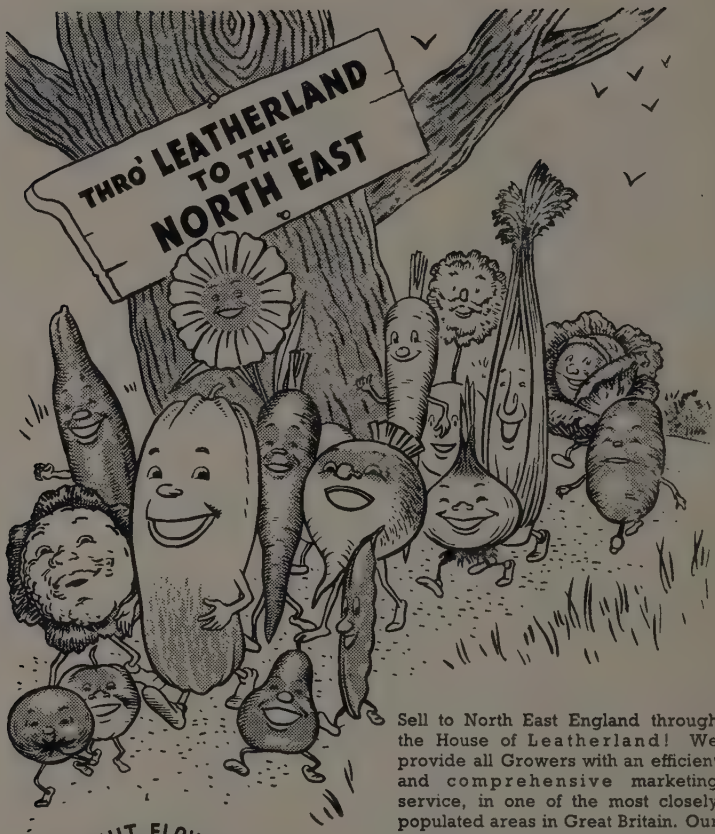

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THE

APRIL 1950

BULLETIN No. 19

No responsibility can be accepted by the Editor, the Editorial Board, or the Mushroom Growers' Association, for statements made or views expressed in this Bulletin, or for any advertisements included in this publication.

Improved Efficiency—or Bust!

Mushroom growers, in common with the rest of the country, are finding the economic situation getting more difficult. The days of grow 'em and sell 'em are over. Nothing is getting cheaper apart from the mushroom they produce.

Negotiations with the Ministry of Agriculture and Ministry of Food have failed to provide the home grower with the slightest protection against unrestricted imports and the matter is closed. The fact that the quantity of mushrooms being imported at the present moment is relatively small is no indication that it is going to remain that way in the future. The flood of foreign produce, combined with a good (?) year for home agriculture and horticulture, has contributed to the fall in prices far more than the foreign mushrooms, which now amount to about 300 tons per annum.

What is the grower to do?

He has high prices to pay for his materials and labour, and a lowering market to face. He can count on little help from sources other than his own initiative, ability and general resilience ; indeed he would be foolish to be so trusting in the face of history ! The feeling is one of retrenchment throughout the country, and the Mushroom Industry is no exception.

Are we satisfied with our own efficiency?

We need to study every new development within the Industry, to increase efficiency, to improve the liaison between grower and grower, grower and sundriesman, grower and research, and to extract the last ounce from the materials and knowledge at our disposal. We intend to do this and we will do it—we've got to.

MUTUAL AID

QUESTIONS & ANSWERS COLLECTED BY THE SECRETARY

Q. *Will you please recommend a good disinfectant which will remain stable for some time, so that small tools and knives can be washed after the removal of disease ?*
A. Suggest using SterIzal diluted 1 : 50. Tools should be wiped, not rinsed, after removal from disinfectant.

Q. *Does a composting machine save man-hours ?*
A. Yes—although a better answer would be that it gives better value per man hour. It does save time and labour although this depends largely upon the size and type of farm : the machine does the job quicker, but it ensures that the job IS DONE and the composting gang are available for other work if necessary without being tired in the middle of the afternoon.

Q. *I am considering the possibility of cropping in rows of concrete ditches or sunken frames, covered with asbestos sheeting, and heated 1" pipes. The boxes of compost would be laid over the pipes after the spawn had run in a forcing shed. The cost of such an arrangement would be considerably more economical : what do you think ?*
A. A consensus of opinion in this novel idea of yours points out that you would need special insulating concrete and more than one asbestos sheet over the trench. With the source of heat so near the compost the problems would be drying out and condensation and as we have no previous experience to go on, I suggest you carry out experiments on a small scale—the latter is just plain business sense.

Q. *What is the procedure for sterilizing with formaldehyde and how do you carry it out ?*
A. Sterilise the day before the house is thrown out. You require 1 lb. of permanganate of potash crystals to 2 pints of neat formalin for every 1,000 cubic feet of air space in the house. The procedure is to place empty 10 gallon drums along the centre aisle at regular intervals and into each pour an equal portion of the formalin. An equal number of cocoa tins containing the crystals are placed level with the drums and on the centre bed. The operator then walks smartly from the far end of the house towards the **open door** (wedge it open) dropping the crystals into the drums. Shut the door and leave over-night ; you will be able to open up and clear the house the next day and carry on with the emptying.

T. Orritt answers questions on Trays

Q. *Doesn't the steam condense on top of the compost, and therefore tend to wet it too much, or is there some idea to counteract this ?*
A. Yes, you do get condensation on the top trays only ; these are usually wet with the moisture dropping from the roof. Shallow trays filled with sawdust and placed on top of each pile will prevent this.

Q. *Is ventilation required during the spawn run ?*
A. Dr. Sinden states : ' Our studies have shown that air is unnecessary during the mycelial growth stage.'

Q. *Your manure is only 4" in depth. Is that why you only crop 2 months ? Is it a disadvantage to have it deeper and crop for 3 months ?*
A. The system is to get the maximum number of crops per year—making the beds deeper would only lengthen the cropping period, therefore defeating the object of the system.

Q. *How do you stack trays in the growing shed ?*
A. See ' The Tray System ' enclosed with this issue. (Ed.)

Q. *Where can I get details of the Steam Composting Method ?*
A. M.G.A. Bulletin No. 7 (pp. 72/73), gives details of the Rapid Composting Method devised by Dr. Lambert.

Q. *How do you control your steam room temperature ?*
A. By an air thermostat connected to an automatic steam boiler.

Q. *Do you fill holes daily ?*
A. After each picking.

Q. *Does watering present any difficulties ?*
A. No. I use a Darlington's 100% rose on the end of the hose and connected straight to the tap.

Q. *How many trays to a carton of spawn ?*
A. One quart carton to 30 square feet of bed area.

Q. *What size of steam shed do you consider necessary for* 1,000 *square feet, having due regard to economy ? What are the best materials to use for the shed and what size and capacity of boiler ?*
A. My steam shed is double brick, sand and cement rendered on the inside ; roof of corrugated asbestos sheets, lined inside with flat asbestos sheets, and insulated in between with glass wool, with a door at each end for cooling down purposes. No ventilation is necessary. The roof has plenty of slope to take condensation down to the walls. The size depends on the size of the trays. Mine is 24′ by 8′ by 7′ high at the eaves, and this allows 300 2′ 6″ by 2′ trays stacked 10 high. The boiler is a 'Paramount' P.6 Automatic Coal or Gas heated steam boiler—I use gas. It has a capacity of 175 lb. evaporation per hour and does the job well.

Dr. Edwards answers questions on Synthetic Compost

Q. *I cannot get my synthetic compost to heat up after the beds have been made.*
A. Synthetic compost does not heat up in the beds as vigorously as a good horse manure compost, but we find that with supplementary heat an effective peak heat can be obtained. The exact amount of heat required depends on the size and construction of your buildings and on the condition of the compost.

Q. *As it is becoming more and more difficult to procure good horse manure for making our mushrooms compost, would you be kind enough to let me know how I can supplement my limited quantity of manure ?*
A. You can use the M.R.A. formula for synthetic compost, or you can use it as a mixture with horse manure, i.e., adding one ton of straw plus M.R.A. Activators to anything from one to three tons of horse manure. Using dried blood only, you can add 3 cwt. of dried blood per ton of straw and mix this with horse manure. We are at this moment engaged on research on the subject of fortifying horse manure, particularly when it is very long.

Q. *Blood is obtainable here at the abbatoirs for next to nothing in its raw state, but the dried product sells at £12 per ton. Can you give us any information on the simplest method of drying blood ?*
A. It is not easy to dry blood except in suitable chemical plant, but you can use the liquid blood if you can transport it and use it immediately. You should use 168 gallons of liquid blood per ton of straw. The straw should be wetted first and then stacked with the Activators and the liquid blood can be watered on instead of adding dried blood.

Dr. Edwards adds these comments :

Several growers have written to the Research Station reporting disappointing results from the synthetic compost described in Bulletin 15. From details given in their letters or in reply to questions it is clear that the compost has not been prepared in the way described there.

In that Report and again when talking to growers about this compost on our Members' Day last May I emphasised that it is not fool proof, any more than horse manure is. If the directions are not accurately followed failure is quite likely. Even when they are followed reasonable skill in cultivation is still needed to grow a satisfactory crop. Our own results and those of some commercial growers have shown that the M.R.A. compost is capable of producing satisfactory yields, if properly managed.

Experience during the past year has focussed attention on the following points :

1. The straw must be thoroughly wet at the start. We have still not seen anything to compare with the drip pipe method of doing this, followed by heating in the bales. Stacking and turning loose straw before adding Activator is entirely unnecessary.
2. When the stack is made it must be trampled firmly, otherwise it will be too loose and will not heat.
3. Peak-heating is very valuable ; it gives a greater increase in crop than it does with horse manure. The compost is usually looser than horse manure compost in the beds, and more supplementary heat is needed to get it up to 120° F.
4. If the beds are sure to be peak-heated, four weeks composting is enough ; if not, five weeks. The stack should be turned weekly in either case.

Q. *Where the iron bolts compress the aluminium foil in my Handcraft Hut condensation occurs. Can you suggest a cure ?*
A. Suggest using a bituminous compound to coat the heads of the bolts—this has been successful where no insulation was used.
Q. *Although I have only seen one or two, the slugs are causing considerable damage to my crops. What can I use ?*
A. Meta-fuel which can be obtained from any bona-fide sundriesman.
Q. *I want to use a liquid Gammexane preparation this year instead of DDT ; what do you recommend ?*
A. You can obtain Agrocide 3 in either dust or liquid form. No precis recommendations have yet been made by the makers, but I would suggest you try spraying lightly with 1 : 400 solution, the frequency depending upon the kill required.

A MUSHROOM BED COMPETITOR

In the photograph on the left a good run of spawn is showing just below a sideboard. On the right a denser, whiter growth closely resembling White Plaster Mould is seen overgrowing the compost and even several drops of water on the bottom edge of the sideboard.

A specimen of the mould was sent to Miss E. M. Wakefield at Kew, who reported (7.3.49) : " The fungus is obviously a Basidiomycete. It is difficult to name cultures of Basidiomycetes with certainty, since determination depends partly on microscopic characters of the fruit-body. As far as one can judge, however, the fungus from the mushroom bed is what has been called *Corticium centrifugum* Lev. Bres. This species usually grows on wood, but has been recorded both in this country and in the United States of America as a parasite of stored apples, causing ' Fish-eye Rot.' As pointed out by Rogers and Jackson in Farlowia 1, 286 (1943) the name *C. centrifugum* for this species is untenable, but until more work has been done on the various species of the ' complex ' it is inadvisable to decide on any other." F.C.A.

DO NOT FORGET ....

IN JUST A MONTH'S TIME

THURSDAY
4th MAY

is the date of the

OPEN DAY

to be held at the

Mushroom
RESEARCH STATION
AT YAXLEY

Peterborough

—[11]—

THE TRADE SHOW, sponsored by the M.G.A., is referred to in detail elsewhere (see page 119).

LUNCH this year will be served in a Marquee adjoining the Research Station.
Reserve your seat now

THE RESEARCH FUND

A SERIOUS STATE OF AFFAIRS

Mr. A. DeB. Hovell (M.G.A. Chairman) launched, on 7th December, the 1950 Appeal for funds to finance the Yaxley Research Station. Results so far have been good, but total less than half what was subscribed during the comparable period a year ago. In consequence another appeal was sent to all members by Mr. Fred. C. Atkins (M.R.A. Chairman) on 11th February. The results of that second letter could not be assessed when we "went to press." The list of contributions given below is complete up to 10th February.

Messrs. Nashleigh Mushroom Farm Ltd. set the ball rolling with their cheque for £50. The John Thwaites Group repeated their generosity of last year with cheques totalling 40 guineas. Messrs. Geo. Monro Ltd. honoured with their cheque for £25 an undertaking they gave a year ago to contribute that sum for at least three years. Messrs. J. B. & F. W. Young, General Sir Oliver Leese, Messrs. A. DeB. Hovell, Stanley Middlebrook and Noble Mushrooms Ltd. subscribed £25 each, and a number of other growers increased their 1949 contribution "in case it is needed this year."

Smaller growers and others who are not growers sent along their cheques with a promptitude particularly commendable in a period of low prices.

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Jupp, J. S.	2	2	0
Leatherland, G. Ltd.	2	2	0
Merry Orchard Prod. Ltd.	2	2	0
Parkinson, G.	2	2	0
Smith, G. W. & Sons	2	2	0
Trusler, W. J.	2	2	0
Wyllie, D.	2	2	0
Winder Bros.	1	10	0
Biss, J. S.	1	1	0
Bradley, K. C.	1	1	0
Coope, O.	1	1	0
Land Settlement Association Ltd.	1	1	0
Makowski, W.	1	1	0
Ross, G. D.	1	1	0
Thirsk, G.	1	1	0
Miller, Miss S. A.	1	0	0
Total	£817	0	0

We regret that in Bulletin 18 we recorded that Mr. D. B. Gill had subscribed £5 5s. when in fact he gave £10.

BUILDING A MODERN MUSHROOM HOUSE

By

PETER C. ATKINS

By the number of questions asked me, I am led to believe much interest is being taken by mushroom growers in the new cropping houses under construction at Yaxley by Noble Mushrooms Ltd. Those who attended the last M.G.A. Annual Meeting will recall my brother Fred's reference to them ; they were designed, he said, to enable the M.R.A. formula for synthetic compost to be translated to a commercial plane, and had the blessing of the Agricultural Research Council.

The houses were designed by my father, in consultation with the other Directors of Noble Mushrooms—Ben Noble and brothers John and Fred—and it was my privilege to supervise and participate in the construction of the first house (and to resolve the difficulties which not unnaturally arose from a new type of building in which the use of timber was reduced to a minimum). The work was completed by my brother-in-law, Jack Wharton. My brother Richard machined the many castings and cross-bearers for us. It was quite a family affair !

I have been asked to describe the methods used and to answer in this Bulletin some of the questions which visitors are asking. If I may I will tackle the various parts of the building in the order of erection. The houses are sectioned off from a rectangle constructed of 11″ cavity brick walls (two 4½″ walls with a 2″ gap between and bonded by wall ties every 2′ along and every third course) which are supported by 13″ foundation walls ; these in turn are on concrete. Each house measures 40′ × 15′ 3″ inside.

The first of the New Houses being built to test the M.R.A. Synthetic Compost

The doors, windows and wall ventilators were built in, of course, as the walls went up. The windows are cased out of welded aluminium Z purlins. Timber inside this framework takes double panes of glass separated for insulation reasons by a $\frac{3}{8}$″ fillet. The windows have 1″ Holoplast shutters. Incorporated with each window (one on each side of the door) is a ventilator ; both are 1′ 8″ wide, the window is 6′ high and the ventilator below is 1′. This ground ventilator has a 1″ Holoplast shutter ; vermin are excluded by means of a sheet of perforated zinc permanently affixed to the inside of the ventilator. In order to obviate cooling the bottom beds in the house each ventilator is baffled on the inside to deflect draughts towards the floor.

The doors, one at each end of the house, are constructed after the same fashion as the windows—of 1″ Holoplast (7′ × 3′), in Z purlin frames—and so are the exterior attic ventilators above each door and measuring 2′ × 1′ 8″.

It is now necessary to refer to the uprights inside the house which carry the beds—because they also serve to support the corrugated asbestos-cement roof. These uprights are aluminium scaffolding tubes. The outside tubes are 9′ long and the inside tubes 13′ ; the distance between the outsides and insides is 4′ 6″ (the approximate width of the beds), and there is a 2′ 9″ aisle between the two centre 13′ tubes (sufficient to take a barrow comfortably). A line of four tubes is repeated seven times, at 5′ intervals, down the house. Each tube rests on a steel footplate which in turn is mounted on a concrete block. Both footplates and blocks are eventually covered by three inches of " Pudlo " waterproofed concrete laid on a hard core base.

At a level of 8′ from the floor is a series of tubular aluminium cross pieces bolted to the uprights and running the width of the house. At their ends rest castings (to which are fixed one side of the guttering)

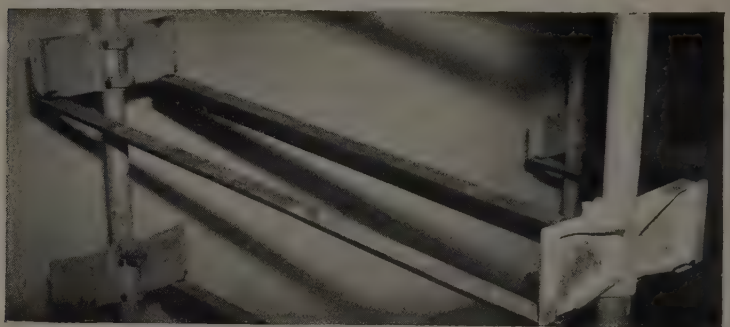
and aluminium Z purlins running the length of the house (supporting the lower sides of the roof). The centre uprights have castings inserted which support the apex of the roof (again on Z purlins) and the louvre brackets. Additional support is given to the roof centrally by means of further castings and purlins.

The roof is tied to the purlins with hook bolts. Along the sides of the louvre-brackets are strips of $\frac{3}{16}$" Holoplast sheeting which are topped by bow-shaped aluminium sheets about $\frac{3}{32}$" thick. Bituminous felt is laid against the louvre to prevent rain from seeping inside the roof. The ends of the louvre are bricked up.

Some timber had to be employed—but very little. In order to be able to secure the false ceiling of 8′ × 4′ × $\frac{3}{16}$" flat asbestos-cement sheets, rather cunningly devised strips of wood rest on and protrude below the aluminium crosspieces I mentioned as running 8′ from the floor. These strips of wood carry others running at right angles to them, and to these the asbestos ceiling is secured with galvanised nails. When the ceiling is in place, the whole is lined with Fibreglass Attic Insulation —except for five sets of 1" Holoplast double ventilator flaps (each 2′ × 1′ 8") placed at intervals above the centre aisle. These flaps are framed in aluminium channelling (which fits into the wood slotted to take it) and open upwards, being operated by means of window cord run over

A view showing the manner in which the roof is supported by the tubular aluminium bedposts.

pulleys. Holes where uprights pass through false roof are plugged with cement.



Cross-bearers of angle-iron are screwed to brackets on the aluminium uprights

The gutters are made by two sides of $\frac{3}{16}$" Holoplast sheeting screwed to aluminium extruded section and their angles controlled by the ground slope. Down the centre are further Holoplast sheets of the same gauge cut at angles to obtain a gentle slope; beneath these is concrete to support a man if repairs to the roof are required at any time. The whole is covered by bituminous felt.

The dividing walls which separate the houses are of standard 8′ × 4′ one-inch Holoplast sheets supported by aluminium extruded section on two courses of $4\frac{1}{2}$" brick wall which is held secure to the floor (reaching to the top of the extruded section). These are sealed by strips of wood pressed into the slotted sides of two joining sheets. In their turn these walls support the extruded section upon which the gutters are built. The junctions of the walls are sealed by triangular filleting and Sealastic compound.

I have mentioned the fact that the aluminium scaffolding tubes which carry the roof and false ceiling also serve as uprights for the mushroom beds. To each tube is bolted one pair of aluminium castings per bed. These take the side and end-boards and are also designed to take angle-iron cross-bearers upon which are laid the bed-boards.

The heating of the houses, provisionally at any rate, will be by thermostatically-controlled electric tubes (also constructed of aluminium). The shortage of coke boilers and hot-water pipes, and the labour-saving and exact-controllability advantages of electricity, have persuaded us to make this experiment to compare the two forms of heating.

These houses were expensive to erect, as so much material (particularly wood) was and still is unobtainable.

Additions to the Library : Bulletin 1 (Jan. 1950), presented by the Federation Nationale des Syndicats Agricoles des Cultivateurs de Champignons. M.R.A. Report for Years 1946-1948, presented by the Mushroom Research Association Ltd. *Major Diseases and Competitors of the Cultivated White Mushroom*, by Fred. C. Atkins. *Darlington's Mushroom News*, Vol. II, No. 4, presented by W. Darlington & Sons Ltd.

MUSHROOMS AT CHESHUNT

The 1948 Report of the Experimental and Research Station at Cheshunt contains the following notes. They are reproduced by permission of the Director of Research, Dr. W. F. Bewley, C.B.E., D.Sc., V.M.H.

The mushroom experiments were concerned with a comparison between the cropping power of various synthetic composts and the best horse manure obtainable. The average yield in four months from the horse manure controls was 1·9 lb. per square foot, but the best of the synthetics was only 1·2 lb. per square foot, and the individual results are not worthy of recording.

On 22nd April, after four months cropping, the horse manure beds were turned over and sterilized by means of steam. No difficulty was experienced in securing a very thorough partial sterilization. The beds were then allowed two days to dry out before reconditioning. After this short rest the beds were gently compressed and were then only half the depth they were originally. Fresh horse manure was mixed with some of the beds at the rate of one part manure to nine parts old bed, by volume. The manure was worked in thoroughly and then the beds were pressed down. The temperature of beds C and D, to which stable manure had not been added, rose to 68° F. Where fresh horse manure was present, it rose to 82° F. for three days, then fell to 78° F., and after three weeks fell to 68° F.

Spawning took place on 7th May, when the beds had dried out sufficiently to allow growth of the spawn. The spawn ran fairly freely in the beds to which stable manure had been added, but growth was not observed in the other beds. Casing was carried out on 1st June, and 15 days later some mushrooms appeared on beds B, E and F containing the fresh horse manure. They were very small and in isolated patches. The appearance of mushrooms was spasmodic and there were no signs of a real " flush " of fruit bodies. The weights produced from the beds in 6 weeks were as follows :—

Treatment	*Crop weight in oz. per 144 sq. ft.*	*Average weight in oz. per 144 sq. ft.*
Bed steamed only		
1	10	16
2	22	
Bed steamed : then 10 % fresh horse manure added		
3	189	171
4	184	
5	141	

As any weight less than 1½ lb. per square foot is a poor crop, it is obvious that any attempt to steam sterilize the old beds for a second crop, even after the addition of a proportion of fresh manure, is useless.

WE DO NOT LIKE having to remind members that their subscriptions are overdue.

HAVE YOU PAID YOURS?

Learning to Grow Mushrooms

By

WILLIAM H. AUSTIN

The words " mushroom growing " mean comparatively nothing to anybody outside the Industry.

Indeed, it meant nothing to me when I left school a year ago.

My father, who had been growing mushrooms for two years as a side line, suggested I might like to " go in for mushroom growing " as a career.

Where could I learn this business ? The obvious way was to go away for a course on an up-to-date and efficient farm—but was there one, prepared to take students ?

I was lucky, because of my father's connections I was able, last summer, to join the staff of one of the best mushroom farms in the country, and I am now nearing the close of my twelve-months training.

I have another advantage—I am only 17 years of age. To my mind it is of great importance to anyone who is starting mushroom growing that his mind is fresh and able to absorb a mass of information unhindered by previous experience of life.

Growing mushrooms can be fascinating, interesting, annoying, troublesome and yet profitable ! (*M.G.A. Bulletin* 8, July, 1947. Page 139. Kent price quoted at 6/- a quarter pound !) No wonder a number of people are going in for the Industry !

One cannot learn by reading the acres of literature already printed on this interesting subject, as there appear to be hundreds of different ways of growing, whereas there can only be one best way. I feel one should learn the practical before the theoretical.

One other way is to start from scratch and learn by one's mistakes. But how expensive ! I believe this is where many people go wrong. If you want to grow mushrooms in a big way, why not get a grower if you yourself are ignorant ?

Do not be put off by looking round a first-class farm ; it may depress you, but it may also save you a lot of money.

First look at the people who grow good crops in cellars, greenhouses and disused tunnels. Mushrooms grow just the same in these places as they do in proper mushroom sheds, although the farm does not look " big."

So far I have discovered a number of pitfalls for the unwary. Take composting for instance : many growers are afraid to add enough water when stacking, yet no one contradicts the opinion I have heard expressed on all sides that one should try to get all the water that is needed into a pile by its first turning.

During my training I have been lucky enough to be able to see how other people grow by going with my tutors to other mushroom farms when they were in trouble ! One grower, who has been growing mushrooms for many years, told me he had not seen a mushroom for weeks. He was exaggerating, but after dashing all over his farm at the " peak heat " of the day in the middle of last summer, it was generally agreed

that his trouble was due to lack of sufficient water at the start of composting.

It seems to me that composting is the most important item in mushroom growing ; whereas human beings cannot live on poor food, so the mushroom cannot grow properly on an inadequate diet. Note well, fellow beginners ; make a good compost and the rest is simple !

A good " peak heat " will improve your crops—but only if the manure is composted correctly. Peak heating gives the manure a final fermentation. I have been advised to aim at a compost containing 65% water, otherwise the manure will be too dry and the mushroom will have too little water to support its development.

" Casing soil " is a subject about which even experienced growers are hesitant to talk. (Perhaps I should say " hesitant to give me advise on " ; they all talk about it !)

And what about diseases ? They are frighteningly numerous !

Truffle to the right of them !
Verticillium to the left of them !
Mycogone to the front of them !
But alas, mushrooms to the rear of them !

Gentlemen, if I could tell you how to prevent disease I would be happy to do so ! All I can say is that I have realised how important it is to be " clean " about the mushroom farm. Where it is possible, isolation of the workers doing the " clean " and " diseased " houses should be carried out as far as possible. It seems obvious to me that this will reduce the possibilities of recontamination (which is one of the most important factors in disease control).

I obviously write as a newcomer to the Industry, as indeed I am ; but I find this subject very interesting and gradually getting into my blood.

One day I hope to have a Mushroom Farm in South Cheshire and anybody will be welcome to visit me ; I can thereby repay the many kindnesses offered me by other M.G.A. members. I have found the M.G.A. very helpful to me in my short life in the Industry and I do strongly advise anyone who has not joined the Association to do so.

Good cropping !

NEW ANGLE ON CASING SOIL

Research by Mons. P. CORTIEU

(Translated and reprinted with the permission of the French M.G.A. from their first post-war Bulletin of January, 1950).

An article published in the *Annales agronomiques* by P. Cortieu describes a very interesting study of casing soils. M. Cortieu, who is chemist to G. Chapuis (a mushroom grower and member of the Council of the French M.G.A.) carried out experiments in the caves at Groyon, in the Jura, and at the dairy research station at Poligny. He was particularly concerned with the effect of chemical and physical composition of the casing soil on the yield and chemical composition of the mushrooms.

For experimental convenience these tests were carried out in boxes

13 inches square and 7 inches deep, which were weighed empty, filled with compost, and weighed again. This method showed that in spite of all precautions, variations in packing occurred and the weight of compost in the boxes varied slightly. Immediately after filling, the boxes were spawned with the same quantity of the same white spawn. They were kept at 15° C. (59° F.) and 95% relative humidity for 24 days until the spawn had grown, and then placed in the cellar of the laboratory at Poligny, at 15° C. and 85% R.H. There they were at once divided into groups of three boxes, each group including one heavy, one medium and one light box. In this way the error which might arise from variations in packing was eliminated as far as possible.

The casing soils were chosen to allow the following factors to be studied :—

(*a*) The physical texture.
(*b*) The pH (between 4·5 and 8·9)
(*c*) The organic nitrogen content (between ·0014 and ·034% of dry soil).
(*d*) The (active) calcium content (between 0 and 8.2% for soils above pH 7).

All the soils tested were obtained from the following six components : two acid soils from Montholier ; a very alkaline soil from Arbois, very fine and rich in calcium ; a neutral, very clayey soil from Mathenay ; and a coarse marl from Groyon.

List of Analyses and Tests.

In a preliminary trial M. Cortieu studied the influence on yield of physical texture, pH, organic nitrogen and active calcium in the soil. This test comprised 16 groups of three boxes. The yield of mushrooms per 100 kg. of fresh manure was recorded, the number of mushrooms, and the weight of mushrooms which died before reaching marketing size. In this way the effect of casing soil on the size of mushrooms and on the health of the cultures was determined. The second test comprised 8 groups of three boxes ; five of these groups were used to confirm the results of the first test, the other three to study the variation in mineral composition of the mushrooms according to the casing soil on which they had grown. Each of the following three groups were collected separately :—

1. Young mushrooms, 1-2 centimetres high, with caps barely distinguishable from the stalk.
2. Fully developed mushrooms picked at the normal time for marketing.
3. Old flat mushrooms.

The proportion of organic nitrogen, potassium, calcium and total ash were determined to ascertain the effect of the casing soil, after allowing for differences in the age of the mushrooms analysed.

Results obtained.

A. *Effect of physical texture.* The analysis by sieving gave the following results :—

Too fine soil seems to create anaerobic conditions in the underlying compost and depresses production.

A casing with very course particles also presents difficulties. The mushrooms always carry a considerable amount of adhering soil on the stalk, which has the effect of killing the mycelium around the stump ; parasites then find this a very favourable medium and the health of the culture is impaired.

After these tests M. Cortieu recommends the following :—Soil retained on a sieve with 10 meshes per inch, 15-20% ; soil passing a 100 mesh sieve less than 5% ; the largest particles must not exceed 1 centimetre in diameter ; between 10 and 100 mesh, variations in texture did not seem to have any important effect on the yield.

B. *Effect of acidity.* M. Cortieu's experiments confirm those of Lambert in America. The pH before casing must be between 7·2 and 8·2 for a good yield to be obtained. That is to say the casing soil must not be acid or too alkaline. It is interesting to note on this subject that the compost after the spawn has run has a pH of 6·6 or lower ; it therefore seems necessary for good fruiting to have a difference in acidity between the compost and the casing soil. Casing soil of low pH, such as 6·0 gives a small number of large mushrooms with flesh like that of young ones picked from an alkaline casing. This may be due to the fact that the small number of mushrooms produced on an unfavourable casing are over-fed by a vigorous underlying mycelium. However this may be it seems that towards the end of the crop the pH of the soil usually lies between 7·0 and 8 5.

C. *Effect of organic nitrogen content :*

(*a*) **On the yield of mushrooms.** Too little nitrogen reduces the yield substantially. Too much is equally bad because it causes the formation of too many mushrooms and a large proportion die before reaching market size. Disease appears and production falls. Casing soil should have between 0·007 and 0·018% of organic nitrogen.

(*b*) **On the appearance of mushrooms.** The size of the mushrooms picked seems to vary according to the proportion of organic nitrogen in the casing soil. Soils poor in nitrogen give the largest mushrooms.

(*c*) **On the nitrogen content of the mushroom.** The nitrogen content of mushrooms seems to be inversely related to the nitrogen content of the casing soil.

D. *Effect of active calcium :*

(*a*) **On the yield of mushrooms :** There seems to be a maximum yield from soil with 2·5 to 3·0% of active calcium. There must be at least 2·0%, but it is unwise to have more than 5·0% of calcium.

(*b*) **On the appearance of the mushrooms :** An excess of calcium causes the growth of a small number of very large mushrooms.

(*c*) **On the chemical composition of mushrooms :** The calcium content of the mushrooms is proportional to that of the casing soil.

E. *Effect of phosphoric acid and potassium content of soil :*

M. Cortieu did not observe any effect of these elements on the yield, appearance or weight of the mushrooms. On the other hand the phosphoric acid and potassium content of the mushrooms seems to be directly proportionate to that of the casing soil.

Fred. C. Atkins Thinking It Over . . . . . .

PRICES DOWN, COSTS UP

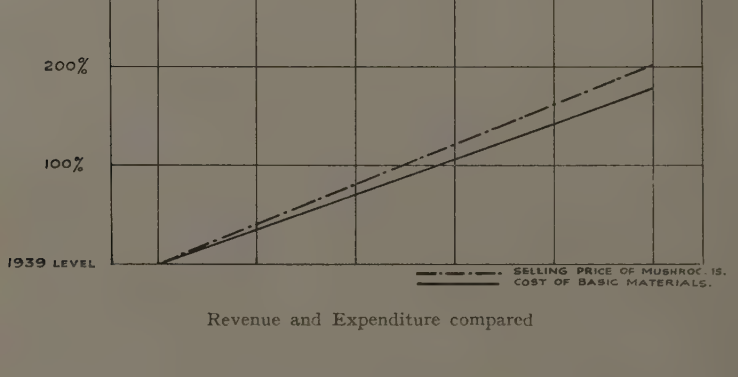
In winter as well as in summer, when I was in my 'teens, I used to indulge in cold baths before breakfast. To be more honest, I used each morning immediately on rising perform " physical jerks " for two minutes before leaping into a bath and (standing up, mind you) squeeze giant spongefuls of cold water over my chest and shoulders.

That was 20 years ago, and I had almost forgotten the breath-seizing shock of that icy sponge. I was forcibly reminded of it a few days ago when I received the annual Balance Sheet and found my income for 1949 had been slashed by one-third compared with the 1948 level.

The shock would have been even more severe had I not been anxious for some months past over the way prices were toppling downhill. I had charted, each year since I came into mushrooms, the **average** price returned by the markets after our salesmen had deducted their well-deserved commission. By average I mean " flats " and " seconds " as well as " best selected."

Bringing this chart up-to-date revealed the drop last year was from 5/6 to 4/4, representing to growers in this country a gross loss of revenue of something like one-and-a-quarter million pounds sterling (based on 25 million pounds of mushrooms produced).

Prices are still very much higher than they were in 1939—or I wouldn't be writing this note !—and I felt it might be illuminating to see how the costs of production had altered during the same period. This is not easy to do, but if one takes the principal items of expenditure incurred in our business one discovers that they stand at 180% above the pre-war level. Labour, for instance, is 94/- a week minimum (compared with 34/9), manure 70/- a ton (21/-), fuel 90/- a ton (36/4) and packing materials 48/6 a gross (16/-). The price of mushrooms, on the other hand, now stands at little more than 200% above the 1939 figure of 1/4.



Revenue and Expenditure compared

It hasn't been possible in the little time at my disposal recently to 'cost' the whole process of mushroom growing from A to Z—though I think the M.G.A. should, one day soon, institute such calculations on a handful of widely-different farms—but it is at once apparent that, in view of the changed incidence of taxation, we are almost back to the pre-war production/sales price-ratio.

Almost—not quite. The margin between profit and loss has narrowed rather suddenly, but now we do not feel so helpless as we used to. We now have the M.G.A. and the M.R.A.—both the envy of mushroom growers the world over—to give us economic and practical and scientific guidance in the days ahead. And who knows what the future has in store for us? When I came into mushroom growing before the war it was years before I met another grower; to-day I have the opportunity to talk over these increasing difficulties with 300 other M.G.A. growers. It is an inestimable consolation.

Price Trends (1939-49)

MUSHROOM GROWING TO-DAY, by Fred. C. Atkins, will be published by Faber and Faber at the end of April. In view of the interest aroused in this book by the comments of our Diarist some months ago, the Secretary has ordered a number of copies for re-sale. It is suggested that any members wishing to make sure of a copy should ask the Secretary to post him one on the day of publication. There will be 180 pages of text and about 50 photographs, and the price will be **12/6.**

SterIzal on the Mushroom Farm

By

A. H. DODD, M.A., F.R.I.C.

Chief Chemist, Newton, Chambers & Co., Ltd.

*SterIzal is used extensively in the Mushroom Industry, principally for the washing down of houses and bedboards. It is a powerful disinfectant which kills unprotected bacteria and thin-walled fungal spores in an hour at a dilution of 1 in 400 parts water to 1 in 1,000. More resistant fungal spores may need 1 : 100, and certain exceptionally resistant spores 1 : 50, to be effective in the same period.

SterIzal is highly toxic to the larvæ of flies. As regards other mushroom pests, the free larvæ of eelworms are readily killed at 1 : 400 —or less, so long as they receive a fair dose. No information is available on its action on mites ; one would expect the early nymphal stage to be destroyed, but adult mites and resistant " resting " stages are, doubtless, more difficult to kill, probably because they are not easy to wet.

Wood is preserved by treatment with SterIzal diluted to 1 : 100, since it destroys any fungi which may be present. It is desirable to give new timber a treatment with 1 : 20 until it will absorb no more, but treatment with SterIzal at 1 : 100 once or twice a year as a routine measure renders creosoting unnecessary. Should there be any reason to suspect the presence of resistant spores such as those of Truffle, it is advisable to use a 1 : 50 solution.

To disinfect tools, they should be dipped in a bath of SterIzal diluted 1 : 100 and wiped (not rinsed) so that a residual film remains.

SterIzal emulsion at 1 : 100 is harmless to most ordinary materials, but complaints that it " perishes " rubber and leather sometimes arise because, when it dries, an oil remains which naturally affects these materials. Rubber gloves, boots, spraying machines and hoses are not affected so long as the emulsion is washed off after use, before the material has had time to dry. Roses and jets should be washed through with water immediately after use with SterIzal to prevent them from blocking.

Although for 30 years SterIzal has been used for sterilising soil in hundreds of tomato houses, it is rarely if ever used for the sterilisation of mushroom casing-soil. The matter deserves consideration. It is realised that the microflora in soil consists of a vast number of bacteria, fungi, actinomycetes and protozoa, which are mostly saprophytes, i.e., they live on dead vegetable matter. When soil is treated with SterIzal the main harmless actinomycetes and a few specialised forms of bacteria are resistant, however, and they survive to build up a new microflora. It is particularly important to note that the active xylenol in SterIzal is destroyed by these surviving organisms in four days at 70° F. (or in fourteen days at 50° F.)

*Coal-tar oils contain a number of so-called tar acids which are powerful disinfectants, insecticides and fungicides. The principal tar acids in SterIzal are the xylenols which, being insoluble in water, are emulsified in a non-soapy base to form a white fluid. When diluted with water the xylenols are dispersed in the form of minute globules (somewhat smaller than bacteria) which provide an enormous surface of active oil. It is an important factor in proper distribution that the emulsion is uniformly dispersed on dilution. The ingredients do not change on storage, but the material should not be frozen, or the active xylenol separates out.

The amazing power of soil actinomycetes to produce substances antagonistic to bacteria and fungi is one of the discoveries of the century. (Streptomycin, for example, which is produced by a soil actinomycete, is being used to combat tuberculosis in human beings.) The desirability of mushroom compost undergoing a thorough fermentation may not be unconnected with the fact that such fermentation favours the survival of actinomycetes, and it would be of great importance to the mushroom grower if it were found that the microflora in casing-soil was one of the vital factors which brought about successful growth.

Steam and formalin are the usual agents employed for the sterilisation of casing-soil, but they depress all microflora on a sort of blunderbuss principle, whereas SterIzal kills the disease-producing fungi and bacteria but tends to spare the actinomycetes. Experiments are to be set up to test whether or not casing-soil partially sterilised with SterIzal shows any advantage in preventing the fall in yield which occurs once the first two or three " flushes " have been gathered.

For partial sterilisation of soil with SterIzal, a dilution of 1 : 100 would be convenient. A pile of soil 4 ft. long × 4 ft. wide × 3 ft. high would require at least 50 gallons of the emulsion, applied in several sprayings. Turning over after each spraying would be advisable for mixing, and overdoing would be better than underdoing. The temperature of the stack should be above 40°F., otherwise it might take a month before the active ingredients dispersed. It would be undesirable to cover the stack, for aeration is necessary. Once the smell had gone the soil could be used.

Conspicuous success has sometimes attended experiments in watering tomato soil **during cropping** with SterIzal at 1 : 800, in order to keep down microflora or inhibit the germination of parasitic fungi. Whether such a procedure would have any effect in mushroom culture would be of great interest.

Leading Article in The Grower, 10.12.49.

A FINE FLUSH

When the Mushroom Growers' Association was formed about four years ago, the attitude of Worthing growers was somewhat cautious. As Worthing is the most important mushroom-growing centre in the country the new Association had to tread carefully.

It did not take Worthing long, however, to recognise the value of the new body, specially when it became a branch of the N.F.U. The election of Mr. A. DeB. Hovell, leading Worthing grower, as Chairman of the Mushroom Growers' Association, is a happy consummation.

Equally important is the establishment and progress of the Mushroom Research Association under Dr. R. L. Edwards. Here again the unselfish pioneering of a few has brought benefit to all.

Our whole Industry will join in congratulating the mushroom growers on a very fine achievement.

Reproduced, with the permission of the Editor, from "The Grower," 18.2.50.

Mushroom Diseases must be Tackled at Once

At the Lancashire glasshouse conference at Preston on 7th February, Mr. F. C. ATKINS, of Noble Mushrooms Ltd., Yaxley, gave what he believes to be the important points in producing successful mushroom crops. Afterwards Dr. R. L. EDWARDS, Director of the Mushroom Research Station, gave the scientific reasons for what Mr. Atkins does.

Summarising his talk, Mr. Atkins said that his Company pay great attention to the following points :—

1. We aim at maximum production to the sq. ft.
2. We compost on concrete and under cover.
3. We have a uniform width of stack.
4. We put all the manure through the upper centre of the stack before we fill.
5. We use a machine to ensure proper shaking-up.
6. We fill to a depth of 8 in. when firmed, and get the surface as flat as possible.
7. We peak heat to 130° F. for several hours.
8. We cool down as quickly as possible.
9. We spawn at 75° F., one quart to 50 sq. ft.
10. We case to a depth of 1 in. as accurately as possible 10 days after spawning.
11. We pick, clean and fill-in the same day whenever possible.
12. We deal with diseases and pest ruthlessly and promptly.

Dr. R. L. Edwards said : Mr. Atkins has explained the sequence of their operations and I am going to pick out a few of them for further comment on their scientific basis.

1. **Water in stack.** The reason for getting as much water into the first stack as possible is not very scientific, but it is worth discussing. It has been found by experience, that if the original stack is made as wet as possible, any surplus water drains away and the normal composting processes gradually reduce the proportion of water until at filling time it is about right.

It is, in fact, almost impossible to over-water at the time of stacking, whereas later in the composting process, for example at the third turn, the stack will hold more water than it needs a week later, and if this extra water is applied, there is not enough time to get rid of it before making up the beds.

It is unusual for a stack which starts with enough water to become too dry by the time beds are made up. The important point is the risk of adding too much water near the end of composting.

2. **Grading.** Mr. Atkins attaches great importance to the systematic change in position in the stack which is effected at each turn. The reason is that American experiments have shown that the best compost is made by aerobic fermentation at 120° F. to 140° F.

These conditions are present only in the upper part of the stack, far enough from the edges for this temperature to be maintained. Around the edge of the stack the compost is too dry and is being cooled too quickly.

Further down inside air cannot get in, the fermentation is anaerobic and the temperature tends to be lower. The objection to anaerobic fermentation is that it tends to produce acid greasy compost and possibly also that it is not building up the right kind of food for the mushroom.

3. **Composting on concrete.** There is no need to rely on soil or any other special sources of moulds and bacteria to carry out the fermentation, because they are always present on straw and manure.

Fermentation in straw can be started rather more quickly by soaking it and then allowing it to heat in the bales, so that the high temperature organisms multiply and spread throughout the mass of straw, without any of the labour of composting.

This straw is then soft, ready to absorb water, and well loaded with fermenting organisms waiting to use the activator or droppings if the straw is being added to heavy manure.

4. **Trampling piles of compost.** Fresh straw, particularly when it has not been pre-heated, is very springy and if it is stacked loosely without trampling, the stack is so open to the passage of air that heat is carried away as fast as it is produced and the stack will not heat, fermentation continues very slowly and the straw is not broken down.

If the stack is made too tight with manure or very soft straw, no air can get in and the fermentation will be mainly anaerobic. We have to reach a compromise which will allow enough air into the stack and still retain heat.

With fresh straw this demands trampling, but when the straw has received a few turns, or with heavy manure after one or two turns, this is no longer necessary. This will always remain one of those things where the grower's judgment reigns supreme.

5. **Even laying of beds.** Mr. Atkins stresses the desirability of laying the beds evenly and level. This depends on the same kind of effect as the stack just mentioned, particularly when the bed is going to be peak-heated.

A very open texture allows free movement of air which cools the bed and also in this case may dry it out too much, whereas local tight packing may cause the temperature to rise too high. Similar effects may be produced during the spawn run and cropping when tight patches, particularly of rather wet compost, prevent the spawn getting enough air for most vigorous growth.

6. **Casing and watering.** There is still a great deal to be learned about these and I only wish to make two remarks. The soil must be able to hold enough water for satisfactory cropping and enough water must be applied to it.

On the other hand too much water seals the pores through which air should be able to pass into the bed and waste gases out of it, and if still more water is applied it will drain into the compost and damage the growth of spawn.

7. Removal of diseased mushrooms. Mr. Atkins has stressed the importance of being ruthless with disease. Assuming that you start with a clean house, the first infected mushroom is caused by a casual spore, or a few spores, carried in by air or by insects.

This kind of infection is practically unavoidable, but you will not lose many mushrooms in this way. On the other hand, if the first infected mushroom is left and the disease is allowed to develop, it produces thousands of spores very rapidly inside your house, these spread easily and may infect a considerable proportion of your next flush.

Each of these infected mushrooms again acts as a distributor if unchecked, so that a whole house can be infected within two or three flushes. The loss of the first few infected mushrooms is the insurance premium you pay to prevent the loss of a hundred or a thousand times as many later on. There is also an increased risk to later crops if infected mushrooms are left on the beds. When a disease becomes established, even at a moderate degree of infection in each house, it may easily take a year or two of sustained effort to eradicate it completely.

CORRESPONDENCE

SOIL & TRACE ELEMENTS : What quality is it which makes a soil suitable for mushroom growing? Physical condition does not supply the complete answer, nor does ordinary analysis. Can it be that some trace element, known or obscure, is the answer? Who knows what remains to be discovered? Some years ago I was corresponding with an experimental scientist who informed me that a certain district in Japan, where the soil appeared to be the same throughout, produced its crop earlier on one portion. This earliness was found to be caused by a rare element in extremely small quantity. I. W. READ.

(*What was that element, Mr. Read?*—EDITOR.)

UP AND UNDER : I used to grow an acre or more of mushroom beds on the floors of melon houses. Some of these beds contacted brick walls. During the first crop, mushrooms appeared freely from all the joints in the brickwork for a height of 2 to 2½ feet above the beds. In the centre of these houses were raised beds made on wire netting. One year, as an experiment, cut turves were placed over the wire netting, grass-side upwards. Over this the usual compost beds were made and cased. Mushrooms cropped freely on top and **underneath**—though the latter crop was so entangled in the net as to be impossible to gather.

I. W. READ.

DISTURBING LUNCH : Some of our staff who attended the Annual Luncheon put forward a view that they did not think the price of the luncheon was good value for the money, and as it was dearer than last year they did not consider the food of any better quality. Another point that was raised by some of our staff was that it was rather disturbing having photographers asking for business through the business discussions. DOUGLAS BUSHELL.

(*The Secretary would like other members' views on the second item; on the first all are agreed.*)

Lt. Col. E. Noel writes to the Editor :

I have received Mr. Atkins's appeal, of 11th February, for research funds. I have failed as a mushroom grower and am closing down. Nevertheless I am sending you a subscription of £2, the maximum I can afford, as I greatly appreciate what Yaxley Research has done for the Industry.

You may be interested to know the reasons of my failure. I have been one of the first in this country to follow the American recommendations, namely, to grow underground in trays and use Sinden's method of rapid composting.

I have shown that rapid composting gives 160 sq. ft. of 5 inch bed from one ton of manure, and a yield of 1½ lb. a sq. ft. — but not in the caves I am growing in. This yield was obtained in a surface house from the same compost that only gave ¾ of a lb. underground.

The temperature underground in this country is about 50° F. but with the ventilation necessary the winter temperature drops to 47-48° F. At this level successful growing in caves in trays is not feasible. Professor Sinden agrees. The caves I am using are too straggling and unsymmetrical to heat artificially. Caves are used successfully in the U.S.A. but the underground natural temperature is 55° F.

The other lessons I have learnt are :—

1. The caves must be compact, symmetrical, the floors level, moisture not excessive, access easy, structure secure, supplies of water and electricity feasible. Cross section of galleries uniform. Arrangements for ventilation adequate. They must be near road, rail and market.
2. The manure should be composted inside and also the sterilizing and spawn running. The heat entailed, instead of escaping into the atmosphere, is conserved in the caves and is sufficient to give a growing temperature of about 55° F.

Provided the above conditions are fulfilled, growing underground should be profitable in view of the following important advantages :—

Small initial investment and consequent moderate depreciation charges. Uniform low temperature for year round culture without artificial refrigeration.

Saving of fuel in winter.

Absence of disease and pests (I have, however, been much troubled with springtails, but this is because these caves had been used in the past for mushroom growing and the last growers had abandoned hundreds of tons of compost in ridge beds. Owing to the straggling nature of the caves it is prohibitively expensive to get rid of the springtails.

There is underground accommodation on the outskirts of London which fulfils all the above conditions and which can be rented on reasonable terms. The capital required to grow 16,000 sq. ft. of bed a year would be between £3,000 and £2,500. Do you know of anyone who would consider a partnership ? I estimate the cost of growing (assuming 1½ lb. a sq. ft.) at about 1/8 a lb. The accommodation is sufficient for double this area. The cost of growing should then come down to about 1/4 a lb.

Two views of the M.G.A.'s most successful Fourth Annual Luncheon.

"RESEARCH IS VITAL!"

FOURTH ANNUAL LUNCH AND MEETING

WHAT ABOUT IMPORTS?

Over 120 members and friends attended the Fourth Annual General Meeting and Lunch of the Mushroom Growers' Association at the Restaurant Frascati, London, on Wednesday, 30th November.

The Chairman, **Lt. General Sir Oliver Leese,** welcomed all who were present. They included the Guest of Honour, **Dr. W. K. Slater,** Secretary of the Agricultural Research Council; **Dr. R. L. Edwards,** Director of Research, Mushroom Research Association; **Dr. W. F. Bewley,** Director of Research, Cheshunt; **Dr. W. M. Ware,** Life Honorary Member, M.G.A., and author of Ministry Bulletin 34; **Mr. W. C. Moore,** Director of the Plant Pathology Laboratory of the Ministry of Agriculture; **Mr. W. Morley Davies,** Secretary, Agricultural Improvement Council; **Mr. W. R. Black,** Administrative Officer, Ministry of Agriculture; **Mr. J. K. Knowles** (General Secretary) and **Mr. A. G. Sellars** (Assistant Horticultural Secretary) of the National Farmers' Union. Apologies for absence were received from Sir James Turner, N.F.U. President, who was abroad, and from Mr. C. E. Hudson, Senior Horticultural Advisory Officer, N.A.A.S.

THE LUNCHEON

The Chairman said he was particularly glad to welcome Dr. Slater, who had been a very good friend to the Mushroom Industry, both as Secretary of the Agricultural Improvement Council and now as Secretary of the Research Council. He went on to refer to the one particular subject which he felt would be the most important one for them all in 1950—to get the Mushroom Research Station firmly on its feet. "Last year," he said, "you gave wonderful support for my appeal and we reached our target. We have paid our way for 1949. We have got to do the same in 1950. We are strongly backed by the Ministry, and the Government have promptly paid their share. I do not believe that 1950 is going to be too easy, for money is tight and times are difficult.

"There can be few growers who are not fundamentally interested in research and there must be a good many of us who have had our crops ravaged and damaged by every form of pest and disease who realise only too well that if it had not been for the remarkable discoveries of science and research we could never have withstood our troubles, and by this time would have been virtually out of business.

"We have achieved one fence. We have a synthetic compost—and that means that even if horse manure goes right off and supplies completely fail we can still grow mushrooms. That, I believe to be one of the greatest discoveries of our time."

Sir Oliver went on to point out how much more remained to be done if the Industry were to survive and flourish in the difficult days ahead. Between wars there was always a political cry for cheaper food, and no Government could close their ears to it, and rightly so, especially in these days when from New York there was pressure all the time for a Free Trade policy in Western Europe. More and more had we got to expect imports of mushrooms and other vegetable produce from other

countries, in many of which the standard of living of the workers was infinitely lower than it was here.

In conclusion, Sir Oliver said : " Let us face up to the facts and try to produce more and better mushrooms more cheaply. We can only do this if we modernise the Industry and reduce production costs. I believe that one of the most important factors in reducing costs is to increase the efficiency of research to such an extent that we can more nearly guarantee crops free from disease and pests and other troubles. **I believe that research is absolutely vital if we are to survive."**

Dr. Slater proposed the toast, " Horticultural Research." In doing so he congratulated the M.G.A. upon two things he considered of almost equal importance. The first was the success of the Appeal which had enabled the Research Association to carry on its work. The second arose out of the luncheon. When he had had the pleasure of being with them before he had been very surprised to find no mushrooms ; on the

" Co-operation between growers and research workers is absolutely essential," says Dr. Slater, Guest of Honour. On his left is the retiring Chairman, General Sir Oliver Leese, and on his right our new Chairman, Mr. A. DeB. Hovell.

present occasion he congratulated them because he had found distinct traces of their product in his second course ! (laughter).

Dr. Slater had a few words to say about the position of research with regard to Agriculture in general. Sometimes people said : " This research is a new-fangled thing, not been going for long ; when my grandfather farmed there was no research." They forgot that research had but changed its form. Research had been going on since man first invented the plough.

" I would just like for a moment to say something of what I feel research consists," he continued. " I think it really has two parts. The first consists of the application of knowledge which already exists to the immediate problems of an industry. Some knowledge is there, a problem arises and it is solved. The other part lies in seeking for fundamental background knowledge. It is easy to convince agriculturalists of the need for the first kind of work ; but they so often forget that the solution of their problems depends on many years of careful background research carried on beforehand, and that without that background research, the application cannot be achieved. I think you are apt, sometimes, if I may say so, not to give credit to the research, because the solution seems so easy ; but it has not been easy—it has been hard work indeed for someone in the background

" Another point which I think wants to be emphasised is that we are often apt to look at the spectacular and overlook the humdrum. In your own Industry, if one bed in twenty failed completely you would be very annoyed and angry at a 5% loss. But how many losses added up amount to perhaps a 10% reduction in the whole crop and which go entirely overlooked ? These questions can only be attacked by fundamental research which will give you the lead-in and tell you how to solve the problem. *It may even be only by fundamental research that you will know you are losing* 10%. Some method of preparing a compost may give you that extra 10% about which you know nothing at the present time."

Dr. Slater went on to say that sometimes the research worker was blamed because a problem cropped up quite suddenly and there was no solution—because the background work had not been done. He stressed another need for continual background research work to give the information which would be required for meeting sudden or unexpected emergencies.

" One other point I want to make is the need for very close co-operation between farmers, growers and research workers," he concluded. " It is absolutely essential in all these things that, first of all, the research worker should be fully aware of the problems of the Industry Dr. Edwards will agree with me that nothing could give him greater help than knowledge of what is worrying the Industry as soon as the worry begins. It is relatively easy, very often, to solve a problem in the laboratory, to find the cause of the trouble ; but it is a very different matter to develop a process or method of controlling the trouble in practice. When the laboratory has reached a certain stage you want the help of the grower to put into practice what you have been doing. I was very interested at Yaxley to see the close relationship between the

Mushroom Research Station and Noble Mushrooms' plant, where they were able to try out in the first stages some of the methods Dr. Edwards had evolved. I hope that kind of co-operation will spread throughout the whole of your Association and that when new things are developed at Yaxley you will co-operate in getting them into general practice. Such an Association as yours, where you have a close personal interest in the research organisation, is of enormous value."

Dr. Edwards thanked the Guest of Honour on behalf of the M.G.A. "We have had some very beneficial discussions with him on the future of mushroom research, and he showed us then that his interest is practical as well as scientific," he said. Dr. Slater's stimulating address had given them all a great deal to think about, and if he might single out one point it was the need for contact between the research station and the growers for their mutual benefit. The Yaxley Station really did want to know what the growers wanted.

THE ANNUAL MEETING

Sir Oliver Leese presided at the outset. Before calling on Mr. Watson to read the Secretary's Report he paid tribute to his great efficiency. "It has been a great pleasure for me to work with him," he said, "and I can assure you that he has looked after your interests extremely well. On your behalf and mine I thank him for what I believe to have been a very good year's work." (Applause.)

Mr. Angus Watson reported another year of steady progress. Membership now stood at 420, of which 295 were grower-members (an increase of 36 during the year). The Grading and Insecticides Committees have published their reports, and a Publicity Committee had been set up comprising Mr. Fred Atkins, Mr. Stanley Middlebrook, and Mr. J. E. R. Simons. The M.G.A. Bulletin and its circulation were getting larger, and with Mr. Middlebrook and Mr. W. A. B. Harding joining Mr. Atkins and himself on the Editorial Board he hoped both would go on improving. "I would like to point out," he said, "that this is **your** Bulletin and we want to encourage you to express your views in it whenever you feel you have something worth saying." A News Sheet had just been started and would be circulated whenever anything of

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great interest or urgency happened, rather than that it should await the next quarter's issue of the Bulletin. The Bulletin in 1949 showed, for the first time, a profit of £86. The M.G.A. had sponsored the Appeal for funds to carry Mushroom Research through 1949, and more ambitious plans had been laid for the Open Day on 4th May, in 1950. A Trade Tent would be available wherein sundriesmen and salesmen could meet growers and discuss their common interests. The monthly Visiting Days had considerably relieved pressure on the Secretary's time and was proving most useful in every way.

" We have co-operated with the Ministry in revising their Bulletin 34 : Mushroom Growing, and also in producing their Film Strip, both of which we are hoping to see soon," Mr. Watson continued. " Due to the general policy of co-operation started by the Executive Committee, the Ministry are showing consideration and understanding towards the problems of the mushroom grower. At the same time we are working very closely with the N.F.U. in watching your interests, and where it has been found necessary a number of individual cases have been taken up by the M.G.A.—with 100% success so far."

The attendances of Executive Committee members during the year had been (out of a possible three) : Sir Oliver Leese, Mr. Hovell, Captain Lawrence, Mr. Sinfield, Mr. Stewart-Wood, Mr. Middlebrook, Mr. Filmer, Mr. Allsop and Mr. Atkins, 3 ; Mr. McArthur and Mr. Patterson, 2.

The Report was adopted.

Mr. Fred. C. Atkins (Acting Treasurer), in presenting the Statement of Accounts, referred to the former Treasurer. " During the early days of enthusiastic endeavour," he said, " Percy Major safely steered the M.G.A. through dangerous waters in the vicinity of *Scylla* Atkins and *Charybdis* Middlebrook into the calmer stretches of present day solvency ! It was a great blow to us all when sudden illness, a month after his re-election a year ago, compelled him to resign from office." (Hear, hear.)

There was a balance of Income over Expenditure of £346. Subscriptions had risen 14% but Expenses were also up, and after placing to reserve those items which required almost immediate payment, the Association actually finished the year with a net profit of only £40.

There had been three major items of expenditure. A sum of £126 had been paid to N.F.U. headquarters for 1948, and £131 placed to to reserve against 1949 subscriptions. Office equipment had absorbed £136, which provided the Secretary with a reasonable desk and a first-class duplicating machine in readiness for the News Sheet. " The third item is our Secretary's salary," Mr. Atkins concluded. " We were able by careful accountancy to increase this to the £500 urged upon us at the last Annual Meeting and— if the present steady progress continues— we shall do our best to compensate him for the equally steady increase in his work. I think you will all agree with me when I say : If ever a man had heart and soul in his job it is Angus Watson."

The Accounts were adopted.

Sir Oliver Leese paid tribute to Mr. and Mrs. Atkins for the way in which they had stepped into the breach during the last eleven months owing to the most regrettable illness of the Treasurer. They had all

INCOME AND EXPENDITURE ACCOUNT for the year ended 31st October, 1949

1948	Dr.							Cr.				1948
£	£		£	s.	d.		£	s.	d.	£	s.	d.	£
460	To Salaries and Clerical Assistance		509	6	8	By Subscriptions from Ordinary Members 1948/49			1,171	16	0		930
153	,, Postages, Printing and Stationery		168	16	7	*Less* Amount due to National Farmers' Union	131	5 11					
11	,, Advertisements		10	18	10	,, Amount over-accrued 1947/48	5	4 0					
74	,, Subscriptions to Trade Journals		5	7	0				126	1	11		
	,, Travelling and Hotel Expenses		78	8	0							1,045	14 1 808
3	,, Telephone, Telegrams and Sundry Expenses		39	8	9	Subscriptions from Hon. Members 1948/49						140	14 0 103
	,, Bank Charges and Cheque Books		6	17	6	Sale of Advertising Space in Bulletin			458	8	0		
	,, Costs *re* Research Transfer		47	5	0	,, ,, Literature			95	4	10		509
12	,, Audit Fee		12	12	0	,, ,, Photographs			13	10	0		
		£ s. d.				Stock of Saleable Literature			180	0	0		
127	,, Cost of 1948 Luncheon	82 11 0				*Less* Cost of Bulletin	515	9 7	747	2	10		
62	,, *Less* Sale of Tickets	62 10 6				,, Other Publications	117	1 1					551
65			20	0	6	,, Photographs and Badges	28	11 0					
									661	1	8		
15	,, Depreciation of Office Equipment		27	3	1							86	1 2
			926	3	11				£1,272	9	3		
41	,, Balance being Excess of Income over Expenditure		346	5	4								
			£1,272	9	3								

BALANCE SHEET as at 31st October, 1949

	LIABILITIES	£	s.	d.	£	s.	d.	ASSETS	£	s.	d.	£	s.	d.	£
	Subscriptions paid in advance :							Office Equipment as at 1st November, 1948	135	0	0				
42	Ordinary Members	54	12	0				*Additions* during the year	126	11	3				
2	Honorary Members	7	7	0					271	11	3				
44					61	19	0	*Less* Depreciation	27	3	1				
35	Luncheon Tickets bought in advance				18	15	0					244	8	2	125
30	Sundry Creditors				66	8	11	Library at Valuation as at 1st November, 1948	2	0	0				
110	National Farmers' Union—1948/49 Subscriptions				131	5	11	*Additions* during the year	2	3	2				
	Income and Expenditure Account :											4	3	2	2
84	Surplus brought forward 1st Nov., 1948	125	12	9				Stock of Saleable Literature				180	0	0	
	Add Surplus for the year	346	5	4				Cash at Bank				215	8	11	103
					471	18	1	Petty Cash and Stamps				5	16	6	24
								Sundry Debtors				100	10	2	81
					£750	6	11					£750	6	11	

missed Mr. Major very much indeed. " We have presented him with a silver salver from all who have served on the Committee with him," Sir Oliver revealed, " and their signatures were inscribed on the salver. He was very touched with this tribute and now I would like to ask your permission to convey to Mr. Major our great appreciation of the work he has done for the Association for so many years." (Applause.)

Sir Oliver Leese then retired from the Chair in favour of Mr. Hovell, Chairman-Elect. In thanking members for their great support, he explained that he was not seeking re-election to M.G.A. and M.R.A. Executives for many reasons. He had not the time, he had a largely expanding farm and many other commitments other than to do with growing. He would have to do something in connection with his Regiment, which was celebrating its tercentenary—" and getting older, as I am. I feel you should have younger members on the Committee—and I am not at all certain that Generals are good people to have on Committees !" In Mr. Hovell they would have a first-class Chairman, a first-class grower, a very highly experienced horticulturist with a great knowledge of glasshouse work and a man holding, as Chairman of the Worthing and West Sussex Growers, a very high position among Sussex growers.

Mr. A. DeB. Hovell (Sussex) from this point presided. He said it was 25 years since he and his brother first laid down mushroom beds. His first duty now was the very pleasant one of expressing the Association's thanks to Sir Oliver Leese for the great amount of work he had done during his year in office. Last year had been a momentous one for the M.G.A., and those who had been privileged to serve on committees with Sir Oliver would always remember his unfailing good humour and wise guidance.

NEW OFFICERS

Mr. Alan Condell and Mr. McGregor Bulloch acted as tellers for the ballot for the election of officers for 1950, which resulted as follows :

Vice-Chairman : **Mr. Fred. C. Atkins** (Northants.).

Secretary : **Mr. Angus Watson.**

Executive Committee : **Mr. C. P. Chamberlain** (Wilts.) and **Mr. R. Patterson** (Northern Ireland) were re-elected and **Mr. W. A. B. Harding** (Kent) returns to take the place of Sir Oliver Leese.

M.G.A. Directors on M.R.A. Board : **Mr. Fred. C. Atkins** (Northants.), **Mr. A. DeB. Hovell** (Sussex), **Mr. J. Stewart-Wood** (Bucks.) and **Mr. H. S. Allsop** (Scotland) were re-elected and **Mr. Stanley Middlebrook** (Yorkshire) was elected in the place of Sir Oliver Leese. (Mr. C. P. Chamberlain tied with Mr. Allsop, but gallantly withdrew to obviate a second ballot.)

With regard to the office of Treasurer, Mr. Hovell said a successor to Mr. Major could not at the moment be found, but the Executive Committee were content to leave monetary affairs in the capable hands of Mr. Atkins and Mr. Watson with clerical help from the Mushroom Research Station. The meeting approved this arrangement.

THE GROWER'S GOAL

The Chairman opened the discussion on Policy for 1950 by commenting on the fact that, even in these difficult days, no one was heard

to grumble when his crops were good. "Most of us get good crops sometimes," Mr. Howell said, "but how to get them always is the goal towards which we must aim. To do that I feel that we have to call upon the research worker. Some years ago the tomato-growers were in a very similar position to ours to-day, but thanks to the work of the Cheshunt Station and Dr. Bewley the tomato-grower has had many of his problems answered and he grows good crops year after year. The same things can apply to us with our research station under Dr. Edwards. **Research is not to be indulged in as the whim or fancy takes us; it is a really necessary part of our business."**

It was worthy of note that for each £ they gave, the Ministry of Agriculture gave another, he added. In a few years time the Ministry of Agriculture would take over the whole Research Station but, until then, it was up to them—the growers—to prove its need by keeping it going.

RESEARCH PROGRAMME

Dr. R. L. Edwards, Director of Mushroom Research at Yaxley, before introducing the research programme said he would like to say how much he and his staff appreciated the support the Industry had given them in 1949. "I think **it is the most concentrated effort in research for mushroom growing which has ever been made,"** he remarked. "It could not have been started but for the small group of pioneers, and could not have been carried on without the support of you all – nearly 300 of you, during the year. We appreciate your confidence and your support."

The proposed programme for 1950 had been drafted after discussion between the scientific staff and the Board of Directors (consisting mainly of practical mushroom-growers). The details could be varied if other subjects than those mentioned were considered by that meeting to be more important and the emphasis could be altered. Investigations would follow these lines :—

1. Improving the M.R.A. Synthetic Compost fortifying long-straw stable manure, and peak-heating.
2. The importance of the depth of bed particularly interesting in connection with the Tray System where shallow beds are [illegible] used : the significance of growth substances and the need for trace elements.
3. Control and eradication of Truffle, Verdigris and the Bacterial Diseases.
4. Casing soil which would be tackled from a new angle.

In addition of course the staff would continue to give advice and help to the grower in trouble.

As Dr Slater had pointed out, background research was very important. "We have to do quite a lot of work which may appear, on the face of it, to be quite useless to you," Dr. Edwards continued, "but could not do our more useful work without it. Most of it in our case is done by Mr. Burrows. You may not see much of him when you come to the station; he is not directly concerned with cropping experiments or diseases but his work is none the less important as the foundation for what we are doing."

Speaking of applied problems, he agreed that there were many matters calling for investigation, but some were so vague or so unapproachable by known methods that they felt they would be wasting their time on them. An outstanding example was Site Contamination. Casing soil was another rather nebulous item, but he had included it in the programme under pressure from a considerable number of growers and also from the Agricultural Research Council.

" We have reviewed the previous work," said Dr. Edwards, " and we feel that, although a certain amount of empirical information has come out of that on the relative merits of different types of soil very broadly defined, and the advantages of certain conditions, what we would like is a general solution which will enable mushroom growers who have not access to good soil to do something to their own soil or find a substitute for it which will enable them to grow good crops. We do not think there is much prospect of that coming from direct cropping experiments, so we propose to spend 1950 on laboratory investigation of soils to see if there is any better prospect leading to a practical advance. Apart from that, I think all the items in the programme are of direct practical interest to growers, but we shall welcome and consider very seriously any suggestions you make, either for modifications or for additional items."

Asked whether there could be research into possible additions to the beds, such as watering with a salt solution, Dr. Edwards said some growers were firm believers in salt but Cheshunt have tried it with no effect. It might depend on the conditions of trial. At Yaxley they had started experiments on the addition of growth substances, applied by spray on to the compost, and these would be continued.

LABORATORY AND FIELD TRIALS

Mr. H. N. Ball said he had been most impressed by the M.R.A. Report for 1946-1948, but he felt there was one weakness. The composts were made on such a very small scale that he doubted whether the results drawn from them were a fair indication of what could be expected from stacks of a commercial size.

Dr. Edwards disagreed. He revealed that they had in fact halved the size of their small stacks because the inferences were not reliable enough ! While it was necessary to have a large number of stacks, with limited staff and accommodation it was obviously impossible to have a large number of large stacks. He was absolutely sure that a bed of 10 square feet was big enough ; he would not accept any question about that at all. All the information they had from the general progress of composting, time taken, and temperatures reached, suggested that the net result of composting was very closely similar to what happened in a 12 ton stack. There might be a small difference in effect, but he thought it was small and they tried to allow for it. They would be very much worse off if they reduced the number of stacks in order to increase their size.

Mr. Ball. " I think size is vital. You wish to have so many units and so many trials to get your correct statistics. I suggest you rather emphasise that and overlook a lot of commercial growers who have made their own experiments. In mushroom growing, which is a live thing, you must have field trials rather than laboratory trials."

Dr. Edwards. " I must disagree on the fundamental idea that increase in size makes a thing any more natural. The foundation of all agricultural experiments on modern lines is the work at Rothamsted which has steadily continued to show the increasing value of a large number of small units. The design and interpretation of cropping experiments of this kind is highly technical and comparatively modern. I do not think that any grower or anyone not really trained in the use of technique and design can appreciate how very misleading experiments with a small number of units can be."

Mr. Fred. Atkins. "A year ago I had the opportunity to interview members of the Agricultural Research Council on this very point. As a result, my own Company has now almost completed the erection of those houses, each close on 1,000 sq. ft., in which the M.R.A. composts will be tested on a commercial scale. Full details of composting procedure, rate of production and so on, will be published in the *M.G.A. Bulletin*."

Mr. Ball. " That interests me very much indeed."

TEMPERATURE AND CROPPING

Lt. Col. E. Noel raised the question of the co-relation of temperatures to yields, suggesting the point was important to underground growers.

Dr. Edwards replied to the effect that they could not carry out any really effective experiment on those lines. They had only two houses, and it would mean one would have to be sub-divided into compartments so that each compartment could be maintained steadily at a different temperature.

Mr. A. G. Pointing. " In *M.G.A. Bulletin* 10 (p. 37), statistics were published on the relation of temperature to cropping—experiments carried out by Dr. Bewley."

The Chairman raised the question of imported mushrooms. " A lot of French mushrooms have come in this Autumn and if we are to keep our markets we must produce the volume of mushrooms required, at the price Mr. Strachey thinks it should be," he suggested. " Otherwise he will get them from somewhere else. It is true that in 1950 we hope there will be some tariff reforms which will help us, but we must make the utmost use of all scientific knowledge and go all out to supply the markets with what they need. And I'm afraid it has got to be at a reasonable price."

Mr. F. L. Boulanger said imports was a subject which had weighed very much with him for the past six months. He had three or four friends in the Paris district who grew mushrooms, knew them very intimately and knew exactly what it cost them to grow mushrooms, what their labour costs and what they got for their crops. In one or two cases 90% and in one case 95% of the crop came straight to London, either by air or by quick train service. I had actually written a cheque for the M.R.A. when I received by post one of the bulletins issued by the French M.G.A. In that bulletin was a translation of the M.R.A. formula for synthetic compost—so I tore up my cheque. Why should I send a cheque to our Research Station when all the results went to France? They go to friends of mine who are delighted to compete with me and send over here mushrooms selling in London at 2s. or 2s. 6d.

a pound. I wonder whether it is possible to avoid this? It must be a very sore point with many members."

The Chairman pointed out that the Ministry of Agriculture agreed to give £ for £ on condition all information was published. "I do not know what can be said about it now," he admitted, recalling the lengthy discussion they had on this condition a year ago. "I really feel that if we gave up research for any reason at all we would be very much poorer."

Mr. Fred. Atkins. "We must not forget the advantage we have of being able to dictate to the M.R.A. what problems it shall investigate. French growers cannot do that."

Dr. Edwards. "May I also say that we derive great benefit from the work of American and Dutch research workers in particular. We have the fullest details of their results and it saves us doing the same experimental work (which would take us years)."

Mr. Boulanger. "I agree we have derived enormous benefit from the Americans and in that case it seems to me that we might let the Americans know what we know. **But we should not let those know who do not give any help, yet benefit from our research."**

Mr. John Atkins. "Is it not a fact that by paying an Import Duty on mushrooms sent into this country, the French are contributing indirectly towards our research expenditure?"

Mr. Boulanger said a friend of his who knew practically every chef in the big London hotels had interviewed them on his behalf. "I am sorry to say he could not get me a single order," he said, "although my prices were Covent Garden prices. That was because there is a certain gentleman in London who has taken on the representation of many French growers. He receives mushrooms every day, picks them up at Victoria and delivers them himself to the hotels at absolutely ridiculous prices—which means the Duty is really infinitesimal. It is stupid and ridiculous. The prices of mushrooms sold by the French growers on the French markets are also ridiculous; that is why the French growers do not mind sending them over here—it equals about 11d. per pound."

On the suggestion of Mr. Fred. Atkins, Mr. Boulanger agreed to write an article on the subject for the *M.G.A. Bulletin.*

A galaxy of Scientists - From left to right: Dr. W. M. Ware, Dr. W. F. Bewley, Miss C. W. H. Duncan, Dr. R. L. Edwards, Mr. W. C. Moore, Dr. W. K. Slater and (in background) Mr. W. Morley Davies, seen at the A.G.M.

MY WAY OF GROWING

2—T. A. SMITH, of Thorpe, Yorkshire

We grow our Mushrooms in rhubarb forcing sheds as a catch crop when the sheds are not being used for rhubarb forcing, i.e., between the beginning of April and the end of December. Previous to our growing mushrooms, these sheds lay idle during the Summer months. These sheds have a soil floor, brick walls, wooden posts and roof, and are 168′ long by 42′ wide by 6′ 6″ high. They have span roofs, 4′ 6″ to 5′ to eaves and 7′ to 8′ to ridge. Purlins run lengthwise, held up at intervals of about 12′ to 14′ by wooden posts. We market-garden 150 acres, growing most vegetable crops and, of course, rhubarb, so I can assure you the mushroom job takes a bit of " working in " sometimes.

Our own wagons collect the manure as it is made. It is rather on the long and dry side, needing a lot of water as we unload and again at the first turn—and even some at the second and sometimes third turns (chiefly around the sides). We stock it in huge rectangular heaps, 10 to 14 motor loads in a heap (average weight of each load 50 cwt.)

The composting is done out in the open, which means we run the risk of having a heap spoiled by a day's rain, but as the manure is on the long side it will stand a certain amount of extra water, provided we don't get it too near the bedding time. To avoid this we only turn twice or three times outside, doing the rest inside the shed where the compost is to be bedded.

Before we can use the sheds for cropping, of course, the spent rhubarb roots have to be removed. The soil from these roots is limed and screened ; the fine soil is steam sterilized for casing, and the rough stuff is thrown on to the land.

Next the rotary hoe is run over the floor of the shed, 750 gallons of diluted cresylic acid (1 in 25) is applied with watering cans, and the superstructure shed is sprayed down with another 250 gallons at the same strength, a small pump with 1 h.p. engine being used for this job. We then close up the shed for about 36 hours, after which it is ready for the partly-composted manure. This is stacked in two piles down the length of the shed, each with a cross-section similar to that of a potato clamp.

The manure then gets another two or three turns, DDT being dusted all over the heaps immediately after each turn. We allow about seven days between each turn, whether inside or out-of-doors. Three or four days after the last turn we fumigate with 112 lb. of sulphur, burnt in buckets ; we try to pick as still a day as possible for the job, as one of the chief difficulties with our sheds, as with all temporary buildings, I imagine, is the fact that we cannot make them completely smoke-tight. We seal the doors and ventilators with paper and paste, but even then the air inside is beginning to clear a couple of hours after lighting the sulphur.

The next morning we start bedding, making mostly flat beds, directly on the soil floor, of course, 9″ to 1′ deep when trampled down. The temperature of the compost falls down to the air temperature as

soon as it is bedded, consequently we spawn the next day, using moist spawn. This year we are trying some flat with some ridge beds to see if we get a heavier crop for a given area of bed surface. The ridge beds take more compost, spawn and casing soil for a given area of floor space, but we get much more heat in the beds, and cannot spawn till it has dropped. Anyhow we shall see.

After spawning, the shed is dusted with DDT, and after about two weeks is cased, the beds being previously very lightly damped with water. After casing, everything in the shed (walls, roof, beds and paths) is sprayed with DDT liquid. Between spawning and the crop beginning to show, the shed is damped down once a week, and oftener during hot weather. As the roofs are felted and tarred, they attract much heat during the bright sunshine, and in the heat waves we had during last summer we did not cut many mushrooms. Sometimes we whitewash the roofs, at others cover them with shivy (flax mill refuse) as an insulator, but we don't often have heat waves up here in the North.

When the crop begins to show we water more heavily, using a hose between flushes, but the can if water is needed before the flush is off.

We only grade out the big mushrooms, of which there are not many, the " cups " and " spreads " going in together, being packed in 2 lb. chips and sold by myself in the local wholesale market seven miles away. This nearness to a good market allows us to cut (during heavy flushes) and market " pink and white " mushrooms that same morning.

If we look like having trouble with fly we dust with DDT or use the new " fireworks." Occasionally we see a few maggots, but not often do we use liquid Nicotine : fortunately they usually disappear. Of diseases we know very little, chiefly because so far we have been lucky not to suffer from them. Sometimes we have a little *Mycogone* but always at the tail end of a crop. As regards labour we have one " mushroom man " assisted by a girl. They do all the dusting, spraying, watering, cleaning, and most of the cutting. The turning, bedding, spawning and casing are done by all and sundry, supervised by myself or the man.

The periods of time mentioned between the various operations cannot always be strictly adhered to. As I mentioned at the beginning these operations have to be " worked in " with all the other jobs on the holding, such as cleaning jobs left for a rainy day.

We do four sheds each summer, spreading them out over the time when the sheds are not needed for rhubarb forcing, which is our main line.

M.R.A. Annual Meeting : In 1949 the Mushroom Industry subscribed £2,388 towards the maintenance of the Yaxley Research Station, and another £460 resulted from the sale of mushrooms from the two test-houses. It was revealed at the annual meeting of the Mushroom Research Association that expenditure exceeded income by £4. The Accounts were adopted. Mr. Fred. C. Atkins was elected Chairman, Major C. P. Whitaker, Vice-Chairman, and Messrs. Stephenson, Smart & Co., Auditors.

EXTRACTS FROM A MUSHROOM GROWER'S ★ DIARY ★

November 28. I read in "The Grower" that a batch of half a dozen newly purchased thermometers read 4 deg. high and 2 deg. low at 110 deg. F. I have seen greater variations than that with new instruments at 110 deg. and the gap rises with the temperature. At around 140 deg. one might as well guess the reading. I have not yet found a bed thermometer that remains reliable for more than a few months.

December 1. I quote the man at the other end of the phone. "She's a beauty, you'd like her. She's a real smasher. Good skin, clean, robust and very healthy. What short of shape? Well, beautiful; nicely rounded in the right places. Yes, she'll do anything you want without a grumble. What? Oh, yes, you'll have some fun with her, she's good for anything. Cheap? Certainly not; she's quality, the right type. Yes, she can come over right away, I'll introduce her myself, and she's yours if she suits." She does! And she's staying. We'll light her up tomorrow to steam No. 4.

December 4. Writes J. E. Larwood in "The Grower":—"Using a small dairy type boiler 4′ 6″ high and four dustbins, we can steam a yard of soil in an hour—two bins are steaming while the others are being filled . . . . . I find that 15 lbs. steam pressure is sufficient." This surprises me as the normal steaming pressure for soil is 60 to 80 lbs. At this pressure 1½ to 2 tons are done in 15 to 20 mins.

December 8. I'm in the retail trade. An order (to be delivered) for ¼ lb. mushrooms has involved one whole morning and one gallon of petrol, because the client was out on the first two occasions I called.

December 12. From the "Horticultural Trades Journal": "The number of growers who listened to Mr. Gahm's address on 'Mushroom Growing in the United States' was not only a record for this country but for America as well, thereby proving that British Mushroom Growing is a big horticultural industry."

December 13. Few will agree with the statement of the Lea Valley correspondent to "The Grower" that only a handful are growing mushrooms under glass—if the statement applies to the country at large. Is it generally accepted that, as he suggests, growing troubles (presumably with tomatoes, etc.) seem to follow a mushroom crop?

December 15. Chronic trouble with automatic stoker owing I believe to wrong type of fuel. Washed smalls (50% dust) are no use in small stokers. Making application to have the fuel changed but with little hope that anybody cares. Yet we cannot go on like this: the boiler goes out; fuel won't feed; coal won't burn; pig won't go to market!

December 16. Filling a two-turn compost that had its 1st turn 7 days ago and its 2nd three days later. It is physically fully composted and well fire-fanged but there are doubts about its chemical condition.

January 3. Is there anything more uncertain than outdoor mushrooms? Two winters ago beds spawned in October cropped heavily from December onwards in keen frost and snow. This year there is no sign of growth whatever from similar treatment. Yet it is a mild winter by comparison.

January 5. I learn that my fuel is not to be changed despite the recommendation of the Coal Board's engineer that washed smalls are no good for automatic stokers. I regularly receive a " Fuel Efficiency News " from the Coal Board urging me to get the best out of my boilers and every ounce of heat from my coal. Yet they won't supply the correct grade of coal. As I thought—nobody cares.

January 6. The house recased (see September 30) is producing very poor quality and has done from the start. Houses running concurrently, using similar compost, soil, etc., are turning out 1st class quality. How much this defection is due to the secondary heat the compost had after the first casing, and how much to the secondary exposure to air, it is impossible to say. Quantity, too, is badly down.

January 8. Prices are too low for comfort. I'm afraid we've seen the last of the five bobs for the remainder of the peace.

January 11. The Editor tells me he is short of crisp, snappy articles or letters. This should bring him some :—When, oh, when, will manure merchants learn to give us value for money? I hear to-day of a load of racing stable weigh-ticketed at 5 t. 15 cwt. The grower was dissatisfied and re-loaded it immediately on his own lorry and took it to the nearest weigh-bridge. The nett weight was 3 t. 5 cwts.—a difference of 2 t. 10 cwts. Is there such a discrepancy between weigh-bridges? I think not. The logical answer points elsewhere.

February 4. Spasmodic attacks of eelworm are causing worry. They first present themselves in bottom beds. There is a grey mould on the surface of the soil known as Arthrobotrys which seems to be complementary to eelworm. This mould, I gather, is parasitic on the eelworm. According to Darlingtons " Mushroom News " (vol. 2, No. 5, p. 78) **prevention** is fairly simple –the pest is killed off during peak heat and soil sterilisation at 125 deg. for 3 hours. A **cure** on the other hand is apparently unknown.

February 12. Eelworm reported earlier is increasing rapidly. It doesn't appear to creep very quickly from the area in which it is first discovered but one finds daily new areas of varying size. The first symptom appears to be the absence of mushrooms. A few days later Arthrobotrys mould appears on the surface and the only course seems to be to trench round each area to prevent the worms eating into the still growing spawn.

February 18. I hear with dismay of several growers turning over completely to trays. Is this altogether wise without small scale tests to gain experience? I understand one or two people who have tried the system recently have met unexpected troubles, mainly due to two things –use of steam during the propagation period and lack of adequate

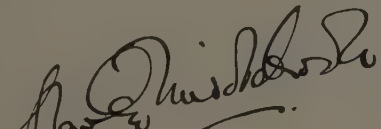
ventilation or air movement during cropping. We've a lot to learn yet before going Hell-for-leather into this untried system—untried, I mean, above ground in our climate. Ventilation in our variable climate, and in our type of house, already presents enough problems with shelf beds and a decent air/bed ratio. Cramming with trays is no simple solution.

February 25. " . . . . . during the reign of the Cæsars in Rome there was a law regarding the grading and selling of mushrooms." From the " B. & G. Review."

February 26. The seven-day compost filled on December 16th has done 1 lb. in 16 days, but shows signs of falling off.

February 28. What folly is this about not wanting Research, or being prepared to let the other fellow pay for it ? Any grower who is sitting pretty in a temporarily happy state of having no troubles, no disease, no pests, yet with plenty of first quality stable manure and a high production, with everything in the houses lovely, can perhaps afford to say " To Hell with Research " or " If the other fellow wants it let him pay for it." Wait till three consecutive crops are turned out with truffle, four with eelworm, six with verticillium in a humid summer ; wait till the manure dealer says he's sorry but he's only some poor quality racing stuff left at £6 per ton ; wait till things go wrong. There comes a time to every grower when he finds he's not as clever as he thought—I know **I've** been through it about six major times in 14 years. We're all cock-a-hoop when things go well, but deuced depressed when trouble follows trouble and we can see no explanation or end. Then we seek help. From whom ? Our next door neighbour ? No ! He knows no more than we do. From the M.G.A. ? **They** can co-ordinate ideas but of themselves they know nothing. **They** (whoever " they " may mean) depend on Research, they rely on it. Co-ordination itself is indeed a form of research. Who can **honestly** say " To Hell with Research " ? Come on. " Chuck it, Priestley." We pay our insurance premiums, don't we ? We MUST have research. We MUST pay up. This is definite and final :—THE RESEARCH STATION CLOSES DOWN IF WE **DON'T** PAY UP.

One more point. Prices are down and likely to stay down. How long can we go on ? How long can we stay in business ? Ample compost, freedom from all trouble, etc., will not help if prices are too low. What's the answer ? Obviously more mushrooms, more weight per sq. ft. Can we do it ? We've been trying ever since we started and get no forrarder. No one can help us but the Research People. Sooner or later they MUST increase our crops. We can't do it ourselves, we're not equipped, we have no science. We've tried and failed. We must pay the brains who can safeguard our future.



A Visit to Holland and Belgium

Described by Dr. R. L. Edwards

On 27th and 28th May, last year, members of the Royal Dutch Botanical Society, including nine Professors and many other distinguished scientists, held a meeting at Houthem St. Gerlach, Limburg. The main features of the meeting were a tour of the Mushroom Research Laboratory, and lectures by Dr. P. J. Bels, Honorary Member of the M.G.A., and by his wife, Dr. H. C. Bels-Koning.

Dr. Bels described the development of mushroom cultivation from the 17th to the 20th century, and compared the yields obtained from a ton of manure by the various methods now in use. He considered that some Swiss growers who use electric cable heating under the beds are the most efficient. They pick up to 660 lb. per ton of manure. (This yield is calculated on the weight of manure, which is mainly droppings, as purchased—EDITOR). Their beds are made in a series of small, closely spaced ridges which give a large surface area per ton. Formerly these would not have survived the very rapid loss of heat from the compost, but with cable heating the temperature of the compost can be maintained without heating the air, which is considered less desirable.

Dr. Bels-Koning started her talk by referring briefly to some of the functions of compost when used under the simple conditions of the cave growers. These include nutrition of the mushroom, continued fermentation to maintain a favourable bed temperature, and suppression of the growth of certain competitive organisms. Dr. Bels-Koning went on to describe the problems now receiving attention in the Dutch mushroom research laboratory. Comparing several very different types of casing they found that the soil with the highest water capacity (30%) was best. Experiments on pH showed that soil of pH 8·2, which was the highest tested, gave the best results.

Ventilation of the bed is considered very important. When broken tile was graded according to size and each size used separately for casing the fraction between 1/12 and 1/5 inch in size gave the best yield; coarser and finer fractions were inferior, but a mixture of very fine (powder to 1/12 inch) and coarse (over 4/5 inch) fractions gave the best yield of all. These results might not apply under different conditions of temperature and humidity.

In caves cropping is sometimes delayed when temperature conditions prevent the natural flow of air, but as soon as this is renewed the beds start to flush. This illustrates the importance of the air supply.

Dr. Bels-Koning reviewed in more detail the effect of steam sterilising and washing compost on the growth of mushroom mycelium and other fungi. Sterilising alone produces toxic substances in the compost, but if it is washed with water after or before steaming these toxins or their precursors respectively are removed and the mycelium can grow. These effects may be related to the composting process and the causes of exhaustion of mushroom beds, and possibly to the unfavourable results of composting at too high a temperature reported by Lambert.

The laboratory at Houthem St. Gerlach, which is directed by Dr. P. J. Bels, has six growing rooms in which boxes of about 3 sq. ft. are

used. The compost is made in a covered yard, mixed with the supplement to be tested, and sweated out in the boxes. About 5 boxes are used for each treatment, and about 250 boxes are used each year.

There is also a microbiological laboratory in which pure culture work on moulds and bacteria of interest in mushroom growing is carried out. Some antagonism experiments have also been made. The cropping experiments are all straight comparisons between treatments, to study either the effect of insecticides on the mushroom, casing materials, or the physical state of compost. The results are statistically analysed for significance, and it is intended to examine them later for information relating to the general biology of fruiting. The laboratory has a fine collection of mushroom literature.

MUSHROOM GROWING IN DUTCH AND BELGIAN CAVES :

In South Limburg and Northern Belgium there are some very extensive systems of caves, most of them resulting from the excavation of limestone blocks for building and similar purposes. The temperature in the caves is relatively constant around 56° F. in summer and winter. Ventilation is from the entrance to the caves and through shafts in the roof which my be 100-ft. long. There is a good flow of air in winter when the temperature difference between the inside and outside favours ventilation, but in the late summer the air tends to become stagnant. The scale of growing varies greatly, one grower having 12½ miles of ridge bed using about 2,500-tons of manure a year, whereas others are very much smaller.

The manure is fermented in stacks near the mouth of the cave, and is packed tightly into moulds, which are then turned out to form ridges. Three ridges are laid together with a path on each side from which the middle ridge can easily be reached. The manure smells strongly of ammonia when it is packed in the moulds, but the smell is quickly lost as the manure cools. The beds are spawned at once, and usually the spawn is not buried because the humidity is so high that it grows freely on the surface of the compost. These growers are very particular about their choice of spawn and Sarazin makes 18 different kinds. The growers select whichever of these they consider most suitable for each part of their cave, according to the exact state of ventilation, temperature, humidity and compost ; for example, No. 20 was said to be suitable for beds near the mouth of a cave where there was relatively strong ventilation, because it resists the tendency to opening of the mushroom attributed to aeration. If it was used in a poorly ventilated part of the cave it would only give deformities, whereas the spawn appropriate for such areas if used near the entrance would give mushrooms opening much too quickly. All mushrooms are picked while tightly closed, and preferably small. Mushrooms weighing 1½ ounces are too big for first quality. Yields are about 85 lb. per ton of manure.

The beds are cased 4-6 weeks after spawning with very fine limestone from the walls of the caves, varying between white and sandy colour. The casing is ½" thick. Water is applied only in the paths between beds, and is drawn into the casing by capillary action. Owing to the high humidity evaporation from the casing must be extremely slow. Small ridges of the casing 2" or 3" high are laid across the paths to hold in the water. The casing has a surface as smooth as very fine sand.

There was a fair amount of bacterial spot, and occasional *Verticillium* and *Mycogone* on the mushrooms. Brown and white plaster moulds occur on the beds. Hygiene is not very good, and is rather difficult to maintain because volatile disinfectants cannot be used. There is a free passage of air through the caves and volatile material applied to one group of beds could not be kept away from adjoining sections. Lime is the principal material applied to infected sites which are then left unused, possibly for several years, to allow any disease to die out.

Flies occur, sometimes in large numbers, particularly Phorids. There were also some Sciarid flies ; I saw no Cecid larvae but did not search for them in the compost. Springtails are fairly common and are called " Mites noirs." Mites are also found and in one cave there was an extremely heavy infestation. In this the mites had eaten round the base of the mushrooms and these were also brown on top, but the inside of the cap was perfectly clean. Mites were not observed in the compost. The grower had given one treatment with HETP, but this was obviously insufficient for an infestation on that scale. We examined an old site where a month previously he had a similar attack and we found a few mites and springtails remaining on the floor there. Another grower had tried Gammexane for killing flies, and said that it killed his mushrooms but not his flies. We were unable to find the reason for this ; our own experience has been exactly opposite. DDT is popular, and is widely used.

Some of the Dutch glasshouse owners are starting to grow mushrooms as a winter crop. This is quite a new development, and Dutch mushroom production is very small, compared with other Western European countries and America.

CONGRATULATIONS to two M.G.A. members on their election to the Editorial Board of *The Grower*—Mr. A. DeB. Hovell and Mr. W. A. G. Warwick.

DEATH OF TWO MEMBERS. We record with regret the passing of two of our earliest members. Mr. F. H. Austin, of Burleydam Nurseries, Whitchurch, Shropshire, met with a tragic accident in February. Mr. T. Sturge Cotterell, M.B.E., J.P., died suddenly the same month, in his 85th year. He was, we imagine, the oldest mushroom grower in the country—in the dual sense of the phrase. The funeral service at Bath Abbey was attended by the Mayor and Officials of Bath Corporation and many representatives of public and private associations with which Mr. Cotterell has been connected. He was a Bath Magistrate from 1903 until 1949 and Chairman of the Bench for many years. As Managing Director of Agaric Ltd., Bradford-on-Avon, which has been exclusively engaged in mushroom growing since 1914, he took a keen and active interest in the problems of the industry right up to the time of his death.

PRESS CUTTINGS

Mr. D. C. Thomas, N.A.A.S. Entomologist, Starcross, said formaldehyde was only partially effective against **eelworm** . . . They were trying a new sterilizer now with better penetrating powers.

Fruit Grower, 1.12.49

Whatever **compost** is used, the growing of good produce lies with the grower and his application to this task.

Old Grower's Gossip, *Nurseryman & Seedsman*, 8.12.49

Mushroom **canning** is to be undertaken in the Peterhead area in the near future following on the development of a mushroom growing industry at Hatton, near Peterhead. Behind this project is Lt. Colonel J. Jones, of Ardiffery, Hatton. *Horticultural Advertiser*, 14.12.49

A working party set up at the instance of the Ministry of Agriculture had resulted in the view that **tariffs** offered the only effective way of protecting horticultural producers. This view had now been accepted at Ministerial level.

L. C. MADSEN, reported in *Nurseryman & Seedsman*, 15.12.49

First big task likely to fall on H. R. Haynes, newly-appointed Secretary of the National Market Produce Show Society, is that of seeking a site in London for the 1951 National Market **Produce Show.** Mr. Haynes, who is already General Horticultural Secretary of the N.F.U. will merge his new duties with his present office.

Fruit Grower, 15.12.49

(EDITORIAL NOTE : Lt. Gen. Sir Oliver Leese has agreed to represent the M.G.A. on the Executive Committee of the Show Society.)

Even at 10/-, the 70-page report (M.R.A. 1946-1948) is not expensive ; all mushroom growers will be interested, and to them the **concentrated information** will prove invaluable.

Horticultural Advertiser, 7.12.49

W. H. Young, head and founder of the Lancing firm of W. H. Young & Son, was last week presented with a chiming clock, two comfortable armchairs and a leatherbound book as a token of appreciation for his services to the industry, particularly during the six years he has been Chairman of the Horticultural Branch of the West Sussex N.F.U. The presentation was made by A. DeB. Hovell, of Rustington, the succeeding Chairman. *Fruit Grower*, 15.12.49

The excellent choice of **imported tinned foods** everywhere is most welcome . . . . . Unrationed are French button mushrooms, 2/9 per tin.

Daily Telegraph, 13.10.49.

Mushrooms are being planted up more widely, and **heavy pickings** should come along in a few weeks' time.

Essex correspondent, *The Grower*, 29.10.49.

Size and weight of each of two mushrooms found in France were 40 inches in circumference and **11 lb.** *News Chronicle*, 29.9.49.

(EDITOR'S NOTE : Or 11 lb. per sq. ft. !)

The **strength** or weakness of any trade association lies in the degree of active support which its members give to it. For such a body to be virile and adequately to safeguard the interests of the members that it represents it must have the whole-hearted backing of those members. The greatest danger to its effectiveness is apathy among its supporters.

Nurseryman & Seedsman, 26.8.48.

In J. C. Newsham's invaluable Horticultural Notebook . . . . . we find that Mushrooms are **digested in 80 minutes,** Spinach in an hour-and-a-half, Brussels Sprouts in an hour-and-three-quarters, Cauliflowers in two hours and Peas in two-and-a-half hours. But Radishes, Turnips and Horseradish need four hours for digestion, Carrots four-and-a-quarter hours, Cabbages four-and-a-half hours and Cucumbers (the most stubborn of them all) take nearly five hours.

Gardeners' Chronicle, 26.3.49.

CHANGES OF ADDRESS

GROWER MEMBERS

J. Aspden, Valley Hall Farm, Ramsgreave, Blackburn, Lancs.
Agaric Ltd., Bradford-on-Avon, Wilts.
Major J. H. Barton, Church Farm, Necton, Nr. Swaffham, Norfolk.
W. Davison, Windrush, Inkpen, Berks.
A. G. Pointing, Fairfield House, Bradford-on-Avon, Wilts.
R. L. & R. Speller, Hoe Lane, Nazeing, Essex.
Capt. G. Tweedie, Birch Close, Cardewlees, Carlisle.

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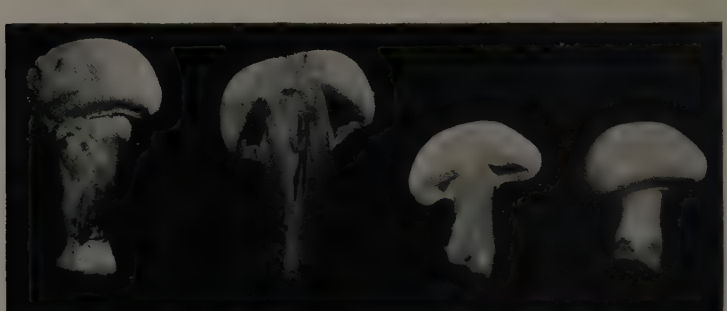
Col. J. P. Kellett, New Amberden Hall, Debden Green, Saffron Walden, Essex.
T. T. Leach, Walford House, Smarden, Kent.
I. W. Read, Kamerunga, Hockley, Essex.



EVER SEEN THIS ?

Have you ever come across a mushroom like that on the left ? The stalk was water-soaked. Infection appeared to begin at the base of the stalk and extended into the cap. A faint greenish tint was observable. The mushroom rapidly disintegrated into a slimy mass. Bacteria were isolated, but were they the culprits ? (The mushroom on the right is normal and is shown for comparison.)

RESEARCH OPEN DAY, 1950

Trade Exhibits as well on 4th May

Despite its shortcomings, the first Open Day organised by the Mushroom Research Association since the Industry "adopted" it aroused much interest and attracted 200 growers and others interested in mushroom growing on a commercial scale. Last year's lessons have been learned, and on Thursday, 4th May, this year there will be much to make the journey to Yaxley worthwhile.

The laboratories will be open from 10 a.m. until 4 p.m., and members of the staff will be in attendance. Although statistical calculations will not have been completed, it should be possible by 4th May to give visitors some indication of the result of experiments now in progress relating to the "boosting" of light, strawy manure. Other experiments will be graphically illustrated.

Noble Mushrooms Ltd. have again offered to conduct parties round their farm, situated a few minutes walk away from the Research Station. Progress to date with their M.R.A. synthetic compost trials will be charted.

One large marquee will house a number of displays by firms closely associated with the Mushroom Industry. The following have indicated their intention to exhibit :—

Bee-Rite Boxes Ltd., Yaxley, Peterborough.
Bradford Fertilizer Co. Ltd., 67 Hammerton Street, Bradford, Yorks.
F. Gough & Son Ltd., Fishergate, Norwich.
Pan Britannica Industries Ltd., Britannica Works, Waltham Abbey, Essex.
Harry F. Atkins (Machine Tools) Ltd., Old Fletton, Peterborough.
The Atlas Basket Co. Ltd., Atlas Works, Harpenden, Herts.
The British Basket & Besto Co. Ltd., Leverington Road, Wisbech, Cambs.
Geo. Monro Ltd., Hertford Road, Waltham Cross, Herts.
Thomas Elliott Ltd., Eagle Mills, 120 New Church Road, London, S.E.5.
The Hymatic Engineering Co. Ltd., Glover Street, Redditch, Worcs.
The Murphy Chemical Co. Ltd., Wheathampstead, Herts.
W. Stevens, Thornwood Common, Nr. Epping, Essex.
Finkerton's Scottish Mushroom Laboratories, Millerston, Glasgow.
Mono Pumps Ltd., Mono House, 67 Clerkenwell Road, London, E.C.1.
Celcure Ltd., Aldwych House, Aldwych, London, W.C.2.
West Dock Timber Co. Ltd., Manchester Street, Hull.
Rural Electrification Services Ltd., Alpha Works, Havelock Road, Southall, Middlesex.
The British Rototherm Co. Ltd., Merton Abbey, London, S.W.19.
E. J. Hibbins, Clare Road, off St. Paul's Road, Peterborough.

There will be another marquee in which three-course lunches will be served between mid-day and 2 p.m. Tickets at 6/- are obtainable from the Secretary, and should be applied for as soon as possible. Before and after lunch, light refreshments will be served in the same marquee, so that those who wish to sit down and talk may do so. There will also be a licensed bar.

MEMBERS' ADVERTISEMENTS

A Partner—active for preference—is required for mushroom farm on borders of Wiltshire and Hampshire. Area, 12,000 square feet of mushroom bed—assured local supply of good and inexpensive stable manure—low overheads—steam heating plant just installed —prospects good. Investment about £700 to £1,000; or would consider complete sale of the business. Write to M.G.A. Secretary for particulars.

TRAY SYSTEM—Roller conveyors, surplus, 64 8′ lengths, 15″ wide @ 9/6 per foot on site. Write Greenacre Graded Mushrooms, Little Horkesley, Nr. Colchester.

CHANNEL ISLANDS—Guernsey: Concrete underground installation suitable for mushroom growing. Any member interested, write to the Secretary.

We are requiring to buy a few lorry loads of Spent Mushroom Compost for us to collect, not too far away from Middlesex. E. J. Woodman & Sons, High Street, Pinner, Middlesex. Telephone: Pinner 802 (5 lines).

CRAVEN

INSECTICIDAL DUSTS & WET SPRAYS

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"BELUMNITE" 4% NICOTINE DUST
PYRETHRUM & D.D.T. DUSTING POWDERS
also
NICOTINE OR D.D.T. FOR WET SPRAYING
to control MUSHROOM FLY & OTHER PESTS

We are makers of Dusting Machines suitable for applying these Dusts including the "EARLY BIRD" ROTARY BLOWER and the "DRIFTER" BELLOWS
Also POWER DUSTERS & HIGH PRESSURE SPRAYING PLANT for all purposes

Full particulars, apply:

W. J. CRAVEN & CO. LTD.— EVESHAM

● COMPOST FOR MUSHROOMS

WHEAT STRAW when treated with ADCO "M" will readily provide a substitute for horse manure for growing mushrooms

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Manure for mushroom culture such as that from racing stables is frequently in too long and dry a condition. This can be considerably improved by using ADCO "M" with better crops as a result.

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KEEP YOU GROWING

Some 50 years ago, we commenced selling CULTIVATED MUSHROOMS on our stand in the CENTRAL AVENUE, Covent Garden, where we have been handling them ever since, as well as at our ASSOCIATED COMPANIES and BRANCHES.

We feel that this amply testifies to the efficiency of our sales service and the inducement thereby offered to our senders, not only to *keep growing*, but also to extend their production.

Personal attention to each grower, whether large or small, is a feature of our service, and by means of a mark, which we allocate, each sender preserves his individuality, and never becomes "just one of a crowd."

We welcome enquiries from new growers and those who wish to change their present marketing arrangements.

CHIP BASKETS and other PACKING ACCESSORIES can be supplied for immediate use.

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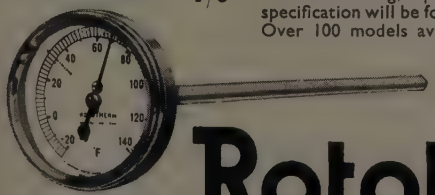

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MILLERSTON, GLASGOW

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'Grams: "PROLIFIC," Glasgow

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G. Griffiths, Wrington Vale Nurseries, Congresbury, Somerset.
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C. L. Loyd, Lockinge Estate Office, Ardington, Wantage, Berks.
F. Matthews, Boundary Farm, Styal Road, Moss Nook, Wythenshawe, Manch
A. Campbell Melville, Fala, Errol, Perthshire.
T. Mitchell, Greaves Farm, Holywell Green, Nr. Halifax, Yorks.
A. J. Murphy, 43 Middleton Way, Fendrayton, Cambs.
Mrs. E. C. Patchett, Coulston House Farm, Nr. Westbury, Wilts.
F. G. Read, South Cottage, Deopham, Wymondham, Norfolk.
J. B. Ritchie, 30 Lovers' Lane, Scone, Perth, Scotland.
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D. M. Nommenson, Crosswater Farm, Churt, Surrey.

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H. W. Heywood, Main Road, P.O. Kloof, Nr. Durban, South Africa.
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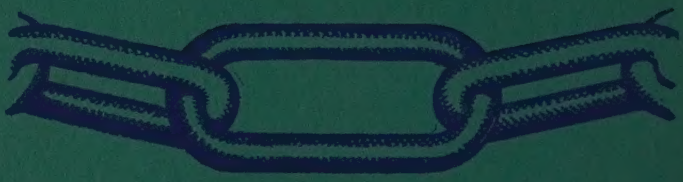

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